# EPILEPSY

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# EPILEPSY

## *What It Is*
## *What To Do About It*

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A Manual for Patients,
Their Families and Friends;
Nurses and Schoolteachers

*by*


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"Dr. Epilepsy"

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PREFACE

# To the Reader

THE TRAGEDY of epilepsy in the old days was borne in on me long before I decided to be a doctor, through seeing the disorder develop in two close friends. When I joined the Department of Neurology at Harvard in 1928, Dr. Stanley Cobb and Dr. William G. Lennox were engaged in a long-range study of the problem, and I owe to them my first realization of its magnitude. Struggling to deal with it as I entered practice and teaching, I realized that this was no ordinary disease to be dismissed with a prescription, or even with a recommendation of operation. Unrelieved epilepsy does consist of occasional lapses of consciousness; it is a career of constant frustration.

These were the considerations which impelled me to the search that culminated in the development of phenytoin, the first specific anticonvulsant medicine. After that, came still more patients, and still clearer recognition of the queries, doubts and fears which were repeated from one anxious sufferer to the next. An hour of

consultation scarcely skims the top from the *reservoir of questions* which should be asked *and answered.* To extend the consultation, I wrote a book in 1943. Written in wartime, in minutes snatched from urgent duties, it left much to be desired. Certainly it now seems strangely outdated and inadequate. Consider the title: *Convulsive Seizures: How to Deal with Them,* which was adopted at the insistence of some of my colleagues, who felt that the best anyone could do for epilepsy was to change its name. Fifteen years later, this attitude is difficult even to remember. How much better to change its nature, and let the public know! Now the public *is* beginning to know—the word "Epilepsy" appears on a billboard not far from where I write, as would have been impossible fifteen years ago, with an appeal for much-needed funds. Another 25 to 40 per cent has been added to the seizure-free statistics; two states have adequate facilities for treatment of most cases; funds are theoretically available from a National Institute for investigative work.

The first edition of *Convulsive Seizures* was noticed by two medical journals. A reviewer in the *Journal of the American Medical Association* remarked, "This book can be recommended to some patients and more families. No doctor should recommend it without reading it. It should be placed in the hands of intelligent and fairly stable people. It is not a book for the over-apprehensive, worrisome, easily agitated person.

Such people would find more than enough to exercise them here." *Epilepsia,* on the other hand, dismissed it as "sugar-coated."

The present book covers much of the ground of the previous one, with many additions. I do not see how I could have written either one in a substantially different vein. In dealing with a disease as serious as epilepsy, there are some grim facts to be faced. In my experience, the worrier will suffer less agony from learning them than from speculating about them. The information proffered here is candid, rather than sugar-coated; it is a frank portrayal of my own experiences and my interpretation of the literature; the case histories are all real, though names, dates and places are disguised; the methods are those I have found most useful, and have reported in detail to the medical public. Others have had similar success with them.

This book is intended for patients, first of all; and is successful in just so far as it meets their needs. Surely their relatives and friends will find something of interest here also. I wish that the people who make our laws and contribute money for clinics and research would read it too, and take some steps to rectify the shocking lack of properly trained personnel, clinics, hospitals, schools and laboratories. A dollar will buy more welfare in this field than in any other in this country.

T. J. P.

*Beverly Hills, California*

### Foremost Facts

Epilepsy is a common disorder, affecting millions.

Untreated or unrelieved, its results are usually catastrophic.

Many men and women have led contented, useful, even distinguished lives in spite of epilepsy.

A revolution has taken place in methods of treatment during the past two decades.

CHAPTER ONE

# Some Examples of Epilepsy

## *One Patient's Story*

JIM R. (Case 1) had a seizure standing behind the counter at the airport. He had been making out a ticket to Zurich, a complicated business, when his hands began to twitch. His eyes became glazed, he uttered a loud shriek, and became blue in the face. Then he crumpled and fell, bruising his forehead on the baggage scales. His arms and legs began to jerk. Saliva dribbled from his mouth, and was whipped into a foam by the movements of his jaws and his gasping respiration. After about ninety seconds, the twitching ceased; he took in a tremendous breath, and his color changed from purple to crimson. He began to relax, and within another minute, he realized what had happened, then saw where he was. His head ached, his tongue was sore where he had bitten it, and his legs were so stiff he could scarcely get up; but these physical discomforts were minor compared to his horrified realization of what the future held for him.

The airport was crowded, for one large plane had just come in, and another was loading. The other clerks, preoccupied with their tasks, could not understand at first what had happened and were slow to come to help. The noise caused some commotion and crowding about that part of the counter, but most of the passengers avoided paying attention and hurried about their business.

Of course, Jim's fears were justified. The manager was most understanding and sympathetic; Jim had been a conscientious, valued employee for many months, but he must understand. . . .

So ended his employment, not only with this airline but with all of them. It was a bitter blow, since all his life he had dreamed of being a pilot or airplane designer. He was unwavering in this ambition even when he was twelve years old, at which time his seizures began without obvious cause. His prosperous and intelligent parents took him to eminent specialists of that time. He was given phenobarbital, which reduced the incidence of his attacks from one a month to one about every six months. He was thus enabled to go to school, where he led his class in mathematics, physics and languages. He went on to college, still planning to be a pilot, and did well in the required courses. He learned to speak excellent German, French and Spanish.

When the war came, he at once tried to enlist, in the Air Corps preferably, but he was

refused by each of the services. By this time, some of the newer anticonvulsants were available, and a combination was found which rendered him seizure-free. He attempted vainly to get into one or another branch of war work. His appearance, his personality, and his education opened many doors to him, but they were at once closed again when his medical history came to light. At last he obtained employment with an airline, avoiding any mention of his old disability, and all went smoothly for several years—so smoothly, that he felt safe in cutting down his medication.

After the attack in the terminal, he returned to his previous level of medication, but it was now inadequate. He continued having one or two attacks a year. He obtained jobs easily, but lost one after another as the seizures recurred. He could not obtain a driver's license. He became very depressed, and considered suicide.

Three miserable years later, he took two drastic steps on his doctor's advice. He underwent a series of tests, taking large doses of each of the available medicines, then, after each dose, had his brain waves recorded. In this way, the best of them was selected. It was still not fully effective.

He therefore went on to the second drastic step. He entered a hospital, with special nurses in attendance around the clock. He was then given such large doses of anticonvulsants that he fell deeply asleep for ten days. On awaken-

ing, he again took his daily dose of medicine. For three months, he was free of seizures. He then had one, but it was his last up to the present.

That was seven years ago. The story has a happy ending. He entered the diplomatic corps and rose rapidly in it, finding it a fascinating career. Aside from the fact that he takes a few capsules of medicine at night, and abstains from strong drinks, he leads a normal, interesting, contented life.

Hundreds of thousands of persons have undergone similar attacks and similar heartbreaking experiences in this country during this year. During the past decade, the majority of the stories have had—or might have had—similar happy endings, but previous to that, recovery was rare. Some convulsive attacks have been disastrous not to individuals alone, but to armies and nations.

### *Two Incidents in World History*

A clear example is the convulsion which Julius Caesar (Case 2) suffered at the battle of Thapsus, less than two years before he was assassinated. After Pompey's death, his partner Cato continued the civil war, and Caesar with his army pursued and surrounded the rebel army in northern Africa. Just as the battle was won, he fell unconscious in an attack. Unre-

strained by their general's characteristic moderation, his enraged soldiers massacred their defeated countrymen. Up to this point, Caesar might have found some compromise with the patrician party, but now it was impossible, and Cato's friends in Rome began to plot against Caesar's life. If Caesar had lived to establish the just and equitable government which he planned, Rome might never have fallen.

Caesar also suffered from frequent minor attacks, or *petit mal* as we should call them today. They are well portrayed in Shakespeare's play and misinterpreted by Cassius as an affectation—as happens still in some cases.

Less clear is the story of the seizure suffered by Napoleon Bonaparte (Case 3) at Waterloo. He is known to have experienced one major convulsion before reliable witnesses, but had none during his many years' imprisonment on St. Helena. He certainly failed to make the best of his opportunities at Waterloo for the first time in a brilliant military career. It is reported that he sat numbly at headquarters without giving the necessary orders, possibly undergoing a series of *petit mal* attacks. Many authorities believe that he had the military resources needed for a victory.

### *Should This Be Called Epilepsy?*

The actual attack of epilepsy takes many forms, of which these examples represent com-

mon types. Sometimes a patient will display disturbances of behavior, which are not obvious seizures.

For instance, Robert M. (Case 4) was a ward of the Juvenile Court when he was brought to The Institute for Child Study in Los Angeles, and referred for medical treatment. Since the age of four years, he had been subject to temper tantrums and bizarre behavior. As he grew older, his behavior grew worse. Early in his teens, he began stealing cars, running away, attempting to seduce young girls, and threatening people with toy guns. His distracted family managed to patch up his difficulties until he was arrested at the age of sixteen. They then turned to a psychologist, who recognized that the boy's antisocial behavior was episodic, and alternated with normal periods. When he came into medical hands a brain-wave test was taken, which showed irregular bursts of high-voltage slow waves, such as are often associated with disturbances of conduct. He was hospitalized under armed guard and a series of tests was carried out over two weeks' time to determine whether any anticonvulsant medication would control the abnormal rhythm.

An appropriate medicine was found which restored the rhythm of the brainwaves to normal. When he began to take the medicine regularly, his whole personality changed. A farsighted judge released him on probation.

He returned to school, and immediately took his place in the upper third of his class. He volunteered for the Army, saw service in Korea, secured a job and married on leaving the Service. As far as anyone in his surroundings is aware, he is a normal, healthy citizen, but he knows that he must take his medicines every day.

## What Does "Epilepsy" Mean?

"Epilepsy" means "seizure" in Greek.

In English, it has been applied to such a variety of conditions that many physicians avoid using it.

Its use as a *medical* term implies nothing in regard to curability, heredity, or complications of the disorder to which it is applied. Some people call any tendency to convulsions "epilepsy."

It is sometimes used as a *legal* term, with a special restricted meaning.

If the public understands the realities of the disorder, the name need no longer cause embarrassment. With all its disadvantages the word epilepsy is so firmly embedded in our language that it will probably never be dropped.

The important thing for the individual patient is to learn what the outlook is for his own case, irrespective of technical terms.

CHAPTER TWO

# What Are Seizures?

## *In General*

It is high time that the light of modern knowledge should fall upon a subject which has been very dark in the past. Convulsions and other recurrent disorders of consciousness tend to be regarded with a peculiar pessimism tinged with dismay, which is not only unnecessary but a serious hindrance to the patient's recovery and to scientific progress. Actually, the disorder is far more amenable to treatment than is generally realized. The majority of those suffering from seizures can be relieved, often by following fairly simple rules. The number of patients at one time incapacitated by their attacks who are now enabled to live practically normal lives runs into the hundreds of thousands.

While despair is wholly unjustified, undue optimism also must be avoided. The subject is a serious one, deserving of careful study. Anyone who has had seizures (or spells or fits), or who has a friend or relative afflicted with them, cannot help realizing something of the peculiar handicap which they involve. Not

many people, however, understand the full meaning of the disorder to the individual who suffers from it, and few indeed understand the enormous extent of the social and economic problems as they exist at present. Fortunately, means are already at hand to improve the situation materially, and it is not too much to expect that further improvements will be made.

A person who has mild seizures usually learns to control them entirely, at the cost of smaller or larger concessions and precautions. A patient who has the affliction in a severe form may be wholly incapacitated by it. In this respect, the problem presented by the tendency or susceptibility to convulsions does not differ greatly from that caused by such chronic diseases as tuberculosis and diabetes, which are now being brought under control.

The individual subject to seizures, however, finds himself faced by peculiar difficulties and limitations. Some of these are inherent in the present means of treating the disease. Others spring from the widespread prejudices and misconceptions which exist about the conditions. A convulsion is, of course, a distressing sight, and an aura of uncanniness still hangs about it, doubtless a relic of the superstitious past, when it would have been considered evidence of possession by the devil. But this scarcely accounts for the heavy overlay of mythology which is usually associated with it. The words convul-

sion, spells, or epilepsy bring up in many minds the wholly unjustified ideas of an impure life, an incurable disease, a public menace, a family disgrace, impending insanity, and the like. In many instances, the terrors which attend it are more serious than the disease itself. If the problem is boldly faced, it is often not so bad after all.

There are, indeed, many bright spots in the outlook for most patients. A great majority of sufferers may be relieved by proper methods of treatment, and may lead normal lives by the exercise of some precautions. Progress in the understanding of the disorder has been rapid in recent years, and improvements in treatment are in prospect. The condition is not painful or disfiguring, and it does not shorten life. It is not a rare disease; any sufferer may find plenty of company. The patient who can learn to control his or her individual symptoms, make the necessary adjustments to the demands of society, and join with others—patients and physicians—in attempting to bring the problem under control for future generations, is entitled to feel a deep satisfaction in these accomplishments.

The social and economic problems presented by the convulsive disorders are staggering. It is estimated that over a million people on this continent suffer from seizures—more than have active tuberculosis! The incidence of epilepsy

is comparable to that of diabetes and both diseases have a mild tendency to run in families. In both disorders, the family physician can help many patients; *a specialist can help more.* But while every doctor is familiar with the physiology of diabetes, few take a comparable interest in epilepsy. There are hundreds of specialists in the treatment of diabetes, to every specializing epileptologist.

The economic aspects of epilepsy are startling. About 60,000 epileptics are in public institutions in this country, and the cost of their maintenance is about $60,000,000 yearly. The expense of caring for those at large, many of them unjustly refused employment, probably amounts to over twice as much. These figures of course give no more than a hint of the frustration, anguish, economic loss and misery involved. The liberty of action of persons subject to convulsions is limited, often in an arbitrary manner, by the laws of many states.

Yet the public is scarcely aware that the situation exists. Modern methods of treatment are often ignored. Proper facilities for caring for certain stages of the disorder are difficult to find. And a mere pittance of funds, of either private or public origin, is available for an expansion of the studies of the condition which have yielded important information in recent years. In this respect, their is a striking contrast with infantile paralysis, a relatively rare disease. But while millions are spent yearly on

poliomyelitis, it is difficult to raise thousands for studies as urgently needed in the field of epilepsy. This aspect of the problem is considered in more detail in Chapter 11, page 169.

### *Definition*

A seizure might be defined in general as a spontaneous, paroxysmal, temporary loss or impairment of consciousness. This definition must not be taken too rigidly, however. A powerful sneeze might come under it, and in a sense with justification, for sneezing may give a normal individual a faint inkling of the experience of a seizure. Some seizures are not wholly spontaneous, in that they may be precipitated by external events or internal diseases. Not all instances of loss of consciousness are considered seizures; for example, the ordinary fainting attack, resulting from a sudden fall in blood pressure, is a quite different affair. Finally, certain disorders which do not involve loss of consciousness are considered to be allied to seizures. An example has been given as Case 4 (page 18) and the subject will be further described in this chapter.

These are medical considerations. There are some legal aspects to the question which will be taken up on page 154.

### *Types of Seizures*

Four main types of seizures are usually recognized. The first two are usually called by

the names given by Calmiel, a distinguished French physician who first recognized their relationship over a century ago.

The *grand mal,* or major attack, is the most spectacular and most distressing; it is the only one properly called a convulsion. The patient loses consciousness—often after some vague warning—falls, twitches, makes chewing movements, and becomes blue in the face. He may bite his tongue. The active phase may last anywhere from a minute to half an hour; it is followed by a stupor. When the patient regains consciousness, he may find himself exhausted and depressed, or in some cases unusually fit and fresh. Cases 1 and 2 (pages 13 and 16) are examples of this type.

The following is an actual record of an attack chosen at random from a series of case reports: (Case 5) "Her face became pale, then flushed. She was at first apparently unconscious, without any movement. This condition lasted for half a minute, and then the convulsion set in. The head was drawn violently to the right; the eyes remained open, the pupils rather dilated. There was some arching of the back, the spasm appeared in both arms and hands, so that the elbows were bent, and the arms drawn up almost level with the shoulders. After a few seconds the right arm began to tremble. The jaw was fixed. The whole attack lasted about two minutes and she was left dull and stupid."

It should be emphasized, however, that there

is a great variety in the types and patterns of attacks, and the one which has been described is only one example.

The *petit mal* or minor attack often goes unnoticed. The sufferer suddenly becomes dazed, seldom for more than a few seconds, then is able to continue with what he has been doing. Such seizures may, however, occur so frequently—up to hundreds of times a day—that the patient's life is made miserable by them. *Petit mal* attacks occurred in Cases 2 and 3 (pages 16 and 17).

The following is an actual account of such a seizure: (Case 6) "The patient was sitting calmly in the office, discussing his symptoms. He stopped in the middle of a sentence, stared vacantly, blinked, and went on with what he was saying, only faintly confused. There were several such pauses in the course of the interview, but the others were only momentary."

*Pyknolepsy* is a name sometimes given to a particular pattern of minor attacks. It is defined as occurring in children, and as consisting of extremely frequent, extremely mild attacks. There is some reason for believing that this form of disorder has an unusually favorable outlook. It is difficult, however, to draw a sharp line between it and other forms of *petit mal*, which also are often relieved by proper treatment and the passage of time, especially in young people.

The psychomotor attack (or *psychic equiva-*

*lent*) is one in which the patient suddenly becomes unreasonable, has a tantrum, or performs some purposeless act. The old term for this condition is "hystero-epilepsy." The degree of impairment of consciousness is variable; he may be wholly unaware of what he is doing, or merely vaguely puzzled by his own impetuousness. Such flare-ups are often precipitated by external circumstances. In normal life, the nearest counterpart to a psychomotor attack is the twilight consciousness that often intervenes between sleeping and waking. An example has already been given in Case 4 (page 18).

One patient's description of his psychomotor attacks was that, "when I felt that way, if a person spoke to me I would answer back mean." Much more complicated actions may be carried out, however. Another patient, during an abnormal period, would wander about the room pulling open all the drawers and disarranging their contents, tipping or pulling down pictures, and throwing books on the floor. If asked why he did it, he would grin foolishly and say he did not know. If someone stayed with him and kept him occupied, his destructive tendencies disappeared. That these two instances are not merely examples of inherent mischievousness is shown by the fact that both patients were greatly improved by treatment, and also became free of attacks of the *petit mal*

and *grand mal* type, from which both suffered in addition. The diagnosis of psychomotor seizures is seldom made in practice unless it is accompanied by attacks of the *grand mal* or *petit mal* type. It is likely, however, that they may occur alone and go unrecognized, or be considered behavior disorders, tantrums, or just peculiarities. Modern methods of diagnosis —particularly electro-encephalography—might reveal many such cases, and some might be relieved by modern methods of treatment.

Rarely, psychomotor attacks may consist of such unreasonable rages (furors) that the patient may become dangerous to himself or those about him, unless confined.

Jacksonian seizures (named after the famous neurologist, Dr. Hughlings Jackson, 1834-1911, who first studied and interpreted them) consist of an uncontrollable jerking or twitching of one side of the face, one arm, or one leg, which gradually spreads to involve all of one side of the body, with or without unconsciousness. Sometimes a peculiar feeling accompanies the jerking. Jackson pointed out (in 1870) that the existence of such attacks, and the pattern of their spread over the body, was an indication that "motor centers" corresponding to the face, arm, trunk, and leg must exist in the brain. This fact, suggested then for the first time, has since been established beyond doubt. A "map" of the cerebral cortex, according to recent in-

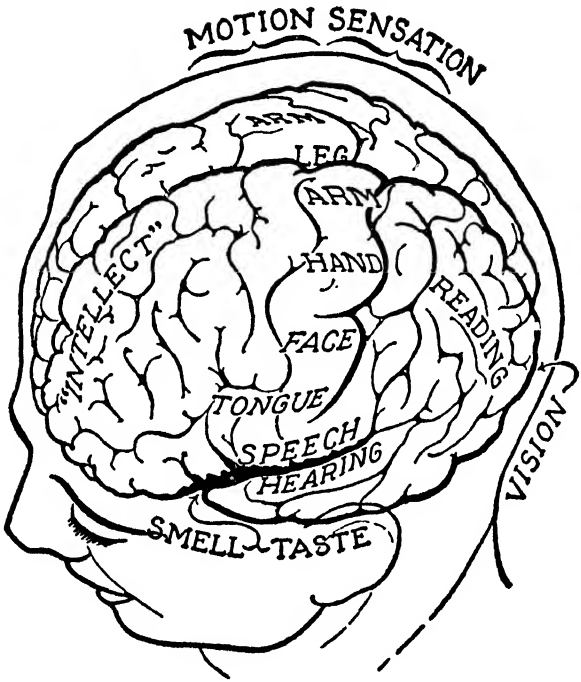


*Fig. 1.* A "map of the human brain, showing the areas which control various activities. The sensations of taste and smell are registered on the under and inner surface of the brain: the area for the sensation of hearing is buried under a deep fold; the sensation of vision is found on the inner, lower surface of each half or hemisphere.

Irritation (by a tumor, or scar, or an electric current) of many of the areas gives rise to an activity of the function represented—motion in the corresponding sensation in sensory areas (exceptions: the sensation of hearing, the functions of speech and writing). Injury to one of these areas may impair the corresponding function (exceptions: the sensations of taste, smell, and hearing).

vestigations, is shown in Figure 1. Not only may movements of muscles result from irritation of the corresponding portions of the brain, but also such sensations as seeing flashes of light or smelling a disagreeable odor, or the erroneous perception of figures of human beings or animals, may arise from irritation of other portions. Seizures consisting of a definite and invariable pattern of movement are called focal, because they suggest the presence of a focal irritation of the brain. The importance of this point lies in the possibility that the visitation may be due to a new growth, tumor, scar, etc., which may require a surgical operation (*see* page 121). Attempts have been made to explain practically all types of convulsion as focal, including those of the *grand mal*, *petit mal*, and psychomotor type, but the idea has not become widely accepted.

Several other types of seizures are known.

### *Types of Seizures*

Some consist of a mild, recurrent disturbance of mental alertness, others of subjective feelings or emotions. Occasionally, such symptoms as spasm of the throat, flushing, watering of the eyes, changes in blood pressure, or attacks of overwhelming drowsiness (narcolepsy) occur in a recurrent form, or alternating with other types of seizures. In children, attacks of abdominal pain and vomiting without obvious

cause may alternate with or substitute for other types of attacks. That these attacks are epileptoid seems to be established by the presence of abnormal brain waves, and relief of the condition with anticonvulsant medicines. The type of headache known as migraine (sick headache) affecting one side of the head and associated with nausea and visual disturbances, sometimes alternates with attacks of one of the other types. Rarely, the seizure attacks only a small part of the body (for example, one side of the face), without impairing consciousness. Under these circumstances, the twitching may be more or less continuous.

The most serious convulsive condition—now fortunately rare—is that known to physicians as *status epilepticus*. The patient remains unconscious, sometimes for days, with intermittent severe attacks. This condition seldom happens in adequately treated cases. It was formerly considered an extremely dangerous complication, but with modern methods of treatment the attack can usually be arrested promptly.

We are on uncertain ground in calling an attack of any kind (except an actual convulsion) a seizure, unless it is recurrent. More will be said about this later. Usually, each patient has his own type or cycle of seizures, and they sometimes tend to recur at certain intervals, or only under special conditions.

### *Auras and Premonitions*

In some cases, attacks occur without warning, and in the absence of any obvious external cause. More frequently, the patient can tell when one is impending, either because of some peculiar bodily sensation which he has learned to recognize, or because of a vague feeling of being depressed or disturbed, lasting often hours or days. This aura, as it is called, consists usually of a physical manifestation, such as a tingling of one extremity, a "sinking" feeling in the stomach, the sensation of seeing flashes of light before the eyes, or of smelling a peculiar odor, or experiencing a peculiar taste. In rarer instances, it takes an emotional or intellectual form. Some patients describe a feeling of extraordinary rapture, others an inexpressible fear. The aura is sometimes accompanied by a disturbance of the electrical rhythm of the brain demonstrable by electro-encephalography (*see* page 163), such as marks the attack itself.

The aura is worth studying, whenever it occurs, for two reasons. The first is that the victim may profit by the warning to escape from a dangerous or embarrassing situation. The second is that his physician may be helped in making a diagnosis and in planning treatment by having an accurate record of the aura.

HIPPOCRATES (ABOUT 400 B.C.) ON *EPILEPSY:*

"*It is thus with the disease called* Sacred;* it appears to me to be in no way more divine nor more accursed than other diseases, but like them, has a natural course from which it originates. . . . The brain is the seat of this affection. . . ."

* Among primitive races, epileptics were often considered holy or inspired.

CHAPTER THREE

# The Causes of Seizures

## *In General*

ANYONE MIGHT have a seizure under sufficient provocation. Convulsions are induced, for example, by various means in the treatment of certain forms of mental disorder. The measures employed have included administration of convulsant drugs, lowering the blood sugar by means of insulin, and the application of electric shocks to the brain. Experience shows that there is a wide variation among different individuals, in the ease with which the attack is produced. Some have a convulsive threshold, as it is called (a resistance to convulsions), far higher or lower than the average.

The same fact stands out clearly from a consideration of the diseases of the brain—tumors, scars, and the like—which often give rise to attacks in subjects who have not previously had them. It appears, in the first place, that tumors or scars of the brain may be accompanied by seizures in one case, while a closely similar

*condition may not produce them in another. In the second place, the attacks do not always stop when the offending lesion is removed. In the third place, it is found that a group of patients who have attacks, for example, after a head injury, have on the average many more relatives subject to convulsions than does a comparable normal group. So even when a local injury to the brain causes seizures, we usually have to suppose that some predisposition exists. This subject is considered more fully on page 159.*

The situation is less clear in regard to the still rare cases in which a chemical abnormality of the body—for example, wide spontaneous fluctuations in the level of the blood sugar—produces seizures. Even in these, we usually have to suppose that the level at which some symptoms occur differs in different subjects.

In his interesting book, *Science and Seizures* (Harper and Brothers, New York, 1941), Dr. William G. Lennox has aptly compared the outburst of a seizure to the overflowing of a pool fed by various springs. The pool is, let us say, the brain; the springs are the usual sources, physical and emotional, of nervous excitation. Normally, this excitation is kept everywhere within bounds (in the brain, by physicochemical stabilizing processes, represented in Figure 2 by a dam), and is drained off to serve a useful purpose in mental and physical activity. A

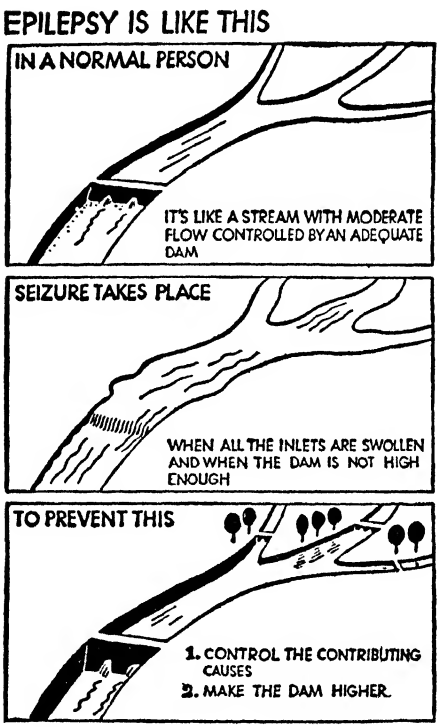


*Fig.* 2. A figurative representation of the normal flow of nervous energy. In the first picture, we see that as long as the inlets of the reservoir are moderate and constant, and the dam and spillway adequate, a smooth flow continues. In the second picture, the inlets are overswollen or the spillway choked, so that a flood (seizure) occurs. The third picture shows how the flood might be controlled or prevented. This book attempts to tell how seizures may be controlled or prevented. (From the pamphlet, Epilepsy—The Ghost Is Out of the Closet, by Herbert Yahraes, published by the Public Affairs Committee, Inc., New York City 20.)

modification of Dr. Lennox's scheme is shown in Figure 2.

The uppermost diagram in Figure 2 might represent the situation in the brain of a wholly normal person. The flow is moderate. The dam is high and strong enough to withstand ordinary vicissitudes. The spillway is adequate to take care of the usual stream, and more. We can imagine that a tremendous cloudburst (in the case of the human being, say a powerful electric shock applied to the brain) would cause an overflow, but the likelihood is remote.

In the middle diagram in Figure 2 are shown some of the abnormalities which would increase the danger of overflow (variations in the tendency to seizures, or convulsive threshold). Erosion of the watershed (overexcitation) might tend to permit floods. The dam might be weak in some places or uneven in height (lack of stability). The outlet might be constricted (indolence, discouragement). It is easy to see that an overflow, once started, might tend to wear down the dam and so perpetuate itself.

The means sometimes available to check convulsions might be inferred from this figure and are indicated in the lowermost diagram. Disordered influx of energy might perhaps be cut down by a psychologic readjustment, and by a change in physical habits (for example, by avoidance of irregularities of hours and diet). Abnormal irritation, if it exists, might be pre-

vented by removing its source surgically. The height of the dam might be raised by the use of stabilizing medicines. The outlet might be increased by well-chosen exercise and other activities. This scheme is, of course, only a framework on which to hang the facts which will be set forth in later chapters.

### *Diseases of the Brain and Seizures*

Among the causes of the convulsive disorders are lesions of the brain. (A lesion means a definite local change in tissues, not necessarily permanent, but clearly visible, either to the naked eye or under a microscope.) There is, let us say, for example, a scar on the surface of the brain near the location of the cells controlling the movements of the left side of the face. It intermittently irritates these cells, as may be seen from the abnormal electrical changes which can be recorded from the scalp overlying them. At times, say as a result of sudden change in blood pressure, an alteration in depth of breathing, or some unknown factor, this irritation grows to a point at which it arouses the cells to discharge so that the face begins to twitch. The violence of the miniature "explosion" in the brain also sets off neighboring cells, so that they too discharge, producing twitchings of the left arm, then left trunk and leg—a Jacksonian attack. Finally, the whole surface of the brain is involved, the patient

loses consciousness, and has a generalized convulsion.

Seizures begin with a localized twitching of muscles only when a source of irritation is in or near the "motor cortex"—that is, the center for movements. If the irritation affects, for example, the portion of the brain receiving impressions of vision, the patient will have the sensation of seeing brilliant flashes of light, or even definite pictures and scenes as a part of the attacks. As has already been explained (*see* page 31), this constitutes a focal seizure. If it occurs in one of the "silent" areas of the brain, unconsciousness or some vague sensation may be the first manifestation of the seizure.

A scar capable of producing convulsions may arise in any one of a variety of ways. The commonest is an injury sustained during birth. Some authorities believe that this is the usual cause of epilepsy, and more important than hereditary tendencies. The wonder is that the great majority of babies escape birth injury, for coming into the world is a pretty tight squeeze for most of us. Rupture or closure of a blood vessel of the brain, which may occur before, during, or any time after birth from any one of a number of causes is a second important cause of scars and areas of atrophy (shrinking) of the brain. Injury to the head in adult life, with or without fracture or penetration of the

skull, may obviously produce scars.* So may infections—for example, meningitis or encephalitis (an inflammatory disease of the brain). Sometimes scars occur in the absence of any obvious cause.

Scars are not the only local lesions capable of producing seizures. Tumors, abscesses and blood clots may have the same effect. Such lesions, which tend to increase progressively in size, usually give rise not only to seizures, but to headaches, paralysis and blindness. A brief account of their effects and what can be done about them will be found in later chapters.

This does not exhaust the long list of lesions which may produce convulsions, but it covers the most important ones—those every physician thinks about when he is confronted with the problem.

### *Idiopathic Seizures*

In the majority of cases, no evidence of external or focal cause for recurrent attacks is found by a careful examination. Under such circumstances, it appears that the tendency to convulsions is so pronounced—the convulsive threshold is so low—that minor, usually unrec-

* In the specialized language of medicine, a scar is "traumatic" if it is the result of violence. Trauma is Greek for wound.

ognized, disturbances of the body's equilibrium may produce a spell. The seizures are then called "idiopathic" or self-produced, which is obviously another way of saying that we do not know what circumstances determine them.

It is to the cases of idiopathic recurrent seizures that the term epilepsy is often applied. The term is a harmless one in itself (Greek for seizure) but it has acquired such alarming and unjustified connotations—being associated in the minds of many with venereal disease, insanity, possession by the devil and the like—that many doctors formerly tried to avoid it entirely. Now that the situation is becoming better understood, and the public has learned that control of seizures is possible in the majority of cases, the objections to the term are disappearing. The term epilepsy sometimes has the disadvantage that its use in individual cases may have legal implications which should be avoided (*see* page 154).

The nature of the predisposition to seizures is obscure. No constant abnormalities are found in the brain or other organs of patients subject to idiopathic convulsions. The predisposition is therefore presumably functional, and probably a chemical disorder—an abnormality in the composition of the fluids of the body. It appears to be hereditary to a certain extent. By careful questioning of a large group of healthy men and women, it was found that on an

average, one in two hundred of their blood relatives suffered from convulsions. By questioning a group of soldiers who had convulsions following head wounds, it was found that an average of one in sixty of their relatives had seizures. In a comparable group of patients with idiopathic convulsions, the proportion was one in forty relatives. There is evidence, moreover, that a typical disturbance of the brain-wave pattern, often associated with seizures (*see* page 74), almost always occurs in a modified form in one or both of the parents and in some of the brothers and sisters of patients subject to idiopathic convulsions.

It seems clear that the threshold against convulsions varies from time to time. In general, young children are more prone to have attacks than are adults, and the convulsions which occur on slight provocation (such as fever or digestive upsets) in infancy are followed by seizures in later life in only a small proportion of cases. Attacks sometimes cease spontaneously, with or without treatment, at any age, but more often when they begin in childhood than when they appear after maturity. The external and internal events which are likely to precipitate convulsions in a predisposed subject vary greatly, and sometimes appear to be specific for the individual. More will be said about them in general in the chapter on treatment.

### *Associated Disorders*

While individuals suffering from seizures may be splendid physical specimens of the human race, observations on large groups of patients show that they fall, on the average, far below standards of comparable normal groups in respect to posture, muscular development and control, depth of respiration, adequacy of circulation, and the like. To what extent this is a result of the seizures, and to what extent a cause, is difficult to decide. Often the patient's general physical condition may be improved by a determined effort, and as a result the seizures are also modified or disappear entirely. An example is given on page 132.

Acute diseases and disorders may precipitate seizures, perhaps only in predisposed individuals. This is most clearly seen in children (and some young animals) who may have one or more convulsions in the course of an acute febrile disease or digestive upset, and then recover entirely. In adults, constipation sometimes seems to set off seizures. So does lack of sleep, or an alcoholic debauch. In some cases, convulsions occur only as a part of a severe hangover ("rum fit"): Women subject to attacks often have particular trouble at the time of their menstrual periods.

Somewhat aside from these occasional effects of relatively minor disorders is the subject of

the general bodily diseases which have a specific tendency to cause convulsions. Most of them are diseases which produce either local areas of damage in the brain (for example, encephalitis accompanying measles) or a disturbance of the chemical equilibrium of the body (for example, disease of the kidneys, or an overgrowth of a portion of the pancreas which produces an excess of insulin, and so an abnormally low blood sugar). The diseases of this group are ordinarily clearly recognizable by their other manifestations, which of course require interpretation by a physician. They obviously present special problems in treatment.

In rare cases, certain specific sensations or experiences will usually produce an attack—listening to some special types of music, for example, or watching a flickering light. Sometimes voluntary excessive deep breathing (as in sighing or blowing a wind instrument) will precipitate an attack in a susceptible individual.

### *The Effect of Seizures upon Body and Mind*

Seizures in themselves produce no permanent changes in the patient's appearance or general bodily health. With rare exceptions, he would pass unnoticed in the throng of mankind. To be sure, a person may injure himself in falling, or while unconscious. But this is extraordinarily rare, even when no precautions are taken. A

few common-sense rules which minimize the likelihood of accidents are given on page 88. Of particular significance is the fact that activity, and the presence of danger or excitement, seem to protect against attacks. Thus, the picture of a patient falling in a fit before an onrushing train is common in fantasy, but almost unknown in reality.

Many patients must, however, struggle with unusual intellectual and emotional problems. These are due to a variety of causes, and it is extremely important to try to think clearly about them.

First—and worst—are the structural diseases of the brain which cause both convulsions and mental defect. The commonest example of this type is congenital imbecility, which is often accompanied by convulsions. Other examples are spreading tumors or degenerative diseases of the brain, which produce severe mental symptoms as well as seizures as long as their course is unchecked. Fortunately, such cases are extremely rare compared with those of idiopathic or "essential" seizures, in which there is no visible structural change in the brain. Since this book is unlikely to fall into the hands of any patients suffering from serious structural diseases, and since treatment of such diseases is a special technical problem, no more need be said about the subject here.

In passing, it might be remarked that damage

to the brain does not necessarily produce either mental deterioration or seizures. We fortunately seem to have more brain substance than we need—certainly removal of large portions may evoke insignificant symptoms or none.

Second should be mentioned the psychologic traits which any chronic disease is likely to produce—dependence, limitation of horizon, rigidity in habits, and a feeling of insecurity and anxiety in unfamiliar surroundings. To these are often added the special burdens which the peculiar nature of epilepsy imposes—the fears of dropping out of the world at any time, of bodily injury or humiliation, and the weight of public prejudice and ignorance about the condition. The child with seizures may be constantly scolded or coddled by his family, and teased or taunted by his companions. The adult may feel driven to concealment, or find himself regarded with a baffling combination of distrust, condescension, and repulsion. No matter how infrequent his attacks, it is easy for him to permit himself to be cut off from work, pleasure and affection. These disabilities are naturally worse in patients who are inadequately or ineffectively treated, and it is a wonder that there are not more emotional cripples among them. Modern methods of effective treatment may be expected to improve the situation considerably. It is obvious that greater understanding and sympathy on the part of

friends and relatives may also make a decisive difference in the patient's feeling.

Third is the temporary effect of sedative drugs—usually a drowsiness, emotional depression, and lethargy, less often a delirium. Such effects may escape the patient's own notice, and his judgment may be so impaired by them that he is unable to follow his routine of dosage accurately. The danger is at its greatest when he tries to treat himself without medical advice, or buys "epilepsy cures" from a drugstore or by mail. Needless to say, the disturbances may be recognized by the fact that they disappear when the drug is discontinued. Fortunately, the use of depressant drugs is less often necessary now than formerly.

Fourth is a type of intermittent or temporary emotional or intellectual disturbance which is apparently of the same nature as the seizures. Unexpectedly, under circumstances which are not particularly difficult, the patient may burst out with an attack of anger or a period of unreasonable activity, which, if he remembers it, afterwards puzzles him. Matters are even worse if he accepts it calmly as his "temperament," and does nothing about it. Emotional outbursts have long been recognized as psychomotor seizures or psychic equivalents, as described above (*see* p. 27). The comparable mental disturbance is less well recognized, but no less important. The patient may experience hours

or days when he is unable to concentrate or to understand problems which are at all complicated, though at other times he is normally alert and able to work. During such times, he may appear perfectly normal to any casual observer, and may carry on his daily routine. It is difficult to call these extended episodes "fits" or "seizures"; they are perhaps best known as periods of dullness. They are clearly distinguished from the other types of mental disturbance which have just been discussed, first by their intermittence, second by the fact that they are often improved or relieved by adequate treatment, and third by the characteristic change in the brain-wave pattern, as will be explained in a subsequent chapter.

A typical example of temporary mental disturbance is the case of P. J. (Case 7), a professional man who has been subject to seizures for about ten years. Before he began to have adequate treatment, it was clear that he experienced definitely abnormal periods every twenty-eight days. During these periods, lasting three to seven days, he would be forgetful, indolent, neglectful of his person, and unable to read connectedly or to grasp more than the simplest problems. It was only during such periods, if at all, that his *grand mal* attacks would occur, although they did not always do so. Electro-encephalographic studies showed a typical abnormality of the brain waves at such

times. He finally had to give up his professional duties. When he took phenobarbital, or followed a regimen of dehydration, the *grand mal* seizures became fewer, but the periods of dullness were if anything worse. In this instance, the most successful medical treatment proved to be the use of phenytoin (dilantin), which practically stopped the convulsions and decreased the periods of dullness. He was then enabled to take up his work again, and became absorbed in it. Apparently as a result, the episodes of dullness decreased still further, and now rarely trouble him.

An extreme example is the case of Eugene, observed by Dr. Charles Fabing of Cincinnati (Case 8). Eugene developed apparently normally until the age of six. He then began to have frequent seizures, and his mentality remained practically fixed at an infantile level. At the age of twenty-three his seizures were brought under control by the administration of phenytoin, and he completed approximately five years of school work within six months. He then took a normal college course, and graduated. At present, his "intelligence quotient" is about 90, and appears to be still improving.

Unfortunately, all of these types of emotional and intellectual impairment are usually lumped together in medical literature as "epileptic deterioration." For this reason we do not know the real incidence of any of them. Outside of

institutions, the three latter types are certainly far more common than the first type. The term "epileptic deterioration" is a particularly unhappy one, for it seems to imply that the disturbances are irremediable, while as a matter of fact much may be done to relieve them in the majority of patients who have the courage to seek help.

Do convulsions in themselves cause injury to the brain, and so perpetuate the condition? This question is difficult to answer, for the evidence is conflicting. It is certainly fair to say that, in general, the longer a patient has had convulsions the more difficult it becomes to control them. But there are numerous exceptions, as the two case histories just given will show. From the practical point of view, it seems wisest to make every effort to bring seizures under control as promptly as may be, to avoid the possibility of damage from them.

### *The "Epileptic Personality"*

In articles on epilepsy of the last generation, the term "epileptic personality" was often used. The theory was that seizures were a form of emotional outburst, like a temper tantrum or a fit of hysterical screaming, only more intense. It was supposed that persons unfortunate enough to be endowed with a certain temperament naturally tended to exhibit such conduct, and that little could be done for them except either

*to persuade them to give up their symptoms,* or to put them out of harm's way. Thus the diagnosis of epilepsy was sometimes made even in cases in which no definite seizures ever occurred. It was even applied from a distance to historic characters, including Cambyses, Alexander the Great, Nero and Peter I of Russia, almost as a term of opprobrium, and certainly without adequate medical grounds.

This conception is now generally abandoned. In retrospect, it is not difficult to see how it arose. Some patients suffering from psychomotor attacks, shunned by society, and treated with sedatives fit the picture extraordinarily well—for example, the patient (Case 11) described on page 136. They are exactly the ones who are most apt to find it necessary to retire to special institutions. The older ideas about epilepsy were chiefly derived from a study of hospitalized cases, which constitute a small fraction of the total number of persons subject to seizures.

While examples of the "epileptic personality" do occur, it is now clear that it is the disorder which produces the temperament, and not the reverse. This is shown by the fact that adequate treatment by means of medicines and exercise often fundamentally alters the personality. (This occurred in Case 7.) Physicians who have had contact with large numbers of patients outside of institutions generally agree

that, as a group, they are outstandingly even-tempered, uncomplaining and devoted, and that among them are to be found many unusually stable, intelligent and delightful personalities.

### *Seizures and Neuroses*

Until recently many physicians have considered that convulsive and other attacks were a form of neurosis, and the two diseases are still confused in the minds of some. A neurosis may be defined for our purposes as a functional disorder of conduct produced by emotional disturbances. Physicians recognize several varieties of neurosis, but any type which expresses itself in the form of physical symptoms is usually known as hysteria.

An example may make the situation clearer. Case 9 is that of a man whose father had attempted to teach to swim as a child by lowering him into the water. The child sank and almost drowned. Since that time, the patient has been afraid not only of swimming, but also of piers and boats. As a result of this and other disagreeable experiences, he has had a resentful attitude not only toward his father, but also toward any man in a position of authority over him. Further, any experience which reminds him acutely of the terror and helplessness which he felt during certain episodes in his childhood

*may send him into a tantrum which might easily* be mistaken for a seizure.

There is no longer any excuse for confusing seizures with neurotic or hysterical behavior. During a true seizure there are definite specific physical alterations in the body which do not occur in cases of hysteria. Further, the treatment of the two conditions is wholly distinct. As will be seen in the later chapters, the use of special medicines and certain hygienic measures is of great value in combating convulsive attacks, while neuroses are most effectively treated by psychologic means (interviews with a psychiatrist, change of surroundings) or by means of tranquilizing drugs.

Nothing, however, prevents a person subject to seizures from developing a neurosis. Neuroses are common among otherwise healthy people, and a person who has to struggle with a serious handicap is particularly apt to need psychologic help. Sometimes psychiatric treatment in itself seems to play a decisive part in controlling the seizures, as will be seen in Chapter 9, but on the whole this is unusual.

Psychoses (severe mental illnesses) are also common in the population at large. Their treatment requires half of the hospital beds in this country. Epileptics are not immune to them either, but the coexistence of epilepsy and psychosis creates special problems, which will be considered in Chapter 11.

## How Your Doctor Can Help You

Seizures may result from a great variety of disorders affecting the body or brain.

It is essential to have the help of a physician who knows the individual as well as the disease, to understand the patient's particular problems.

Tracing down the source of the symptoms may be a complicated and protracted study, but it is essential to intelligent treatment.

Usually your own physician can manage the situation alone, but if you or he wish the help of a specialist, talk it over with your own doctor first.

Specialists are often helpful when difficult decisions are to be made, or when the treatment fails to go smoothly, or to render the patient seizure-free, because they have had unusual training and experience.

CHAPTER FOUR

# The Diagnosis of the Cause of Seizures

## *The Need for Diagnostic Study*

Obviously, it is important to understand a symptom or a disease before attempting to treat it, or even to predict its outcome. We have learned a great deal about the mechanism and some of the causes of epilepsy in the past twenty years, though much remains to be accomplished. As in other fields of medicine, most of the advances in understanding have developed from the application of improved methods of study. We now have available many precise physical and chemical diagnostic procedures, each useful in selected cases. Just which ones should be used in an individual case must depend upon the judgment of an experienced doctor.

The first question arising in a doctor's mind when a patient comes to him complaining of seizures is whether they are due to the presence

of a tumor, a scar, a disease, or a specific chemical abnormality demanding appropriate treatment. While such causes for convulsions are not common, the treatment for them is so definite that it is important constantly to keep in view the possibility of their presence. In general, a tumor pressing on the brain announces its presence by a steady progression of symptoms, and by causing an increase of pressure within the head, accompanied by headache, nausea and changes in the eyes. Scars are recognized by a history of injury, and by the stereotyped nature of the attacks which are often focal or Jacksonian. In either condition, special studies such as lumbar puncture, x-rays of the skull, air-encephalography, arteriography and electro-encephalography are of great help in diagnosis. They will be discussed below. If seizures result from an abnormally low level of sugar in the blood, the attacks always occur at long intervals after meals or when the patient has been exercising. If they are produced by disease of the kidneys, they are usually accompanied by headache, edema, and other striking symptoms. In both disorders, the diagnosis is made certain by a chemical examination of the blood.

### *Medical History*

Usually, the most important part of the story of the illness is a careful, detailed account of the mode of onset and development of the sei-

zures, with especial attention to the events which preceded their outbreak, and any significant incidents leading up to a specific attack. The patient or his relatives may help the doctor substantially, and save his time for other important matters, by *writing out* the whole history of the case, with a list of seizures and their dates, descriptions of typical attacks, dates and results of any special examinations, and dosage of medicines previously taken. More detailed suggestions for the patient's records are given in Chapter 5. Many physicians feel that a complete, detailed history is the best single guide to management of cases of epilepsy, usually more important than any diagnostic test.

### *Physical Examination*

The doctor will probably wish to carry out a careful routine medical examination of the body, head, neck, heart, lungs, abdomen and extremities. Especially important is the examination of the functions of the nervous system, which includes tests for the movements of the eyes, face, tongue, muscles of swallowing and extremities, and tests for sensation and coordination. Examination of the reflexes (for example, striking various tendons with a rubber hammer, and stroking the sole of the foot), sometimes reveals disturbances of muscular control too subtle to be noticed by mere inspection.

The retina of the eye (eyeground) may be examined with an ophthalmoscope, as it may reveal an increase of pressure within the skull, or yield information about certain diseases of the brain. Many other types of physical examination may be found necessary under special circumstances. In addition to the routine physical examination, certain routine laboratory tests are sometimes ordered, such as basal metabolism and chemical examination of the blood when the need is suggested by other manifestations.

### *Special Diagnostic Studies: Lumbar Puncture*

The brain and spinal cord are admirably protected against injury by a bony case, within which they lie suspended in a sac of watery fluid. This fluid, which is constantly formed and absorbed, bathes the interior and surface of the brain, and probably helps to nourish it. Samples of the fluid may easily be obtained by inserting a fine needle into the back. This procedure is made practically painless—usually less annoying than taking blood from the arm—by the injection of a local anesthetic into the skin at the site of puncture. The pressure of the fluid is measured with care, and constitutes an important piece of evidence as to the origin of the symptoms. Evidences of infection or irritation evinced by the number of cells present are oc-

casionally found in the fluid, and chemical examinations may yield information of considerable importance.

The chief disadvantage of lumbar puncture is that it is sometimes followed by an annoying headache which comes on whenever the patient sits up. This gradually wears off in the course of a few days, and is not dangerous or an evidence that anything has gone wrong, but it is incapacitating while it lasts. The treatment is to stay flat in bed.

### *X-rays*

Ordinary x-rays of the skull are not often of importance in the diagnosis of the cause of seizures, but when they do afford positive information they are of great value. They are particularly significant when there is a suspicion of tumor or injury.

A slightly different form of x-ray is sometimes useful. This is an x-ray picture taken after air has been injected into the hollow ventricles, or cavities, of the brain usually by means of a lumbar puncture. This is somewhat simpler for the patient than it sounds. If x-ray pictures are then taken of the head, the shadow of the brain is outlined by the less dense air, and any distortion of its contour, any pressure upon it, or any loss of substance may be accurately outlined (*see* Figure 3). This is called pneumo-encephalography.

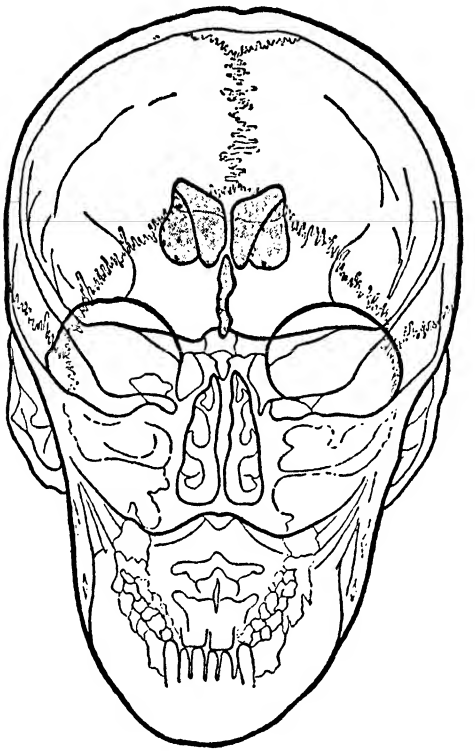

*Fig. 3.* Drawing of an x-ray picture of the skull, showing air in the ventricles of the brain after removal of the spinal fluid by lumbar puncture. (A similar result is sometimes attained by making openings in the skull, and injecting the air directly). The air appears as a dark shadow near the center of the skull cavity. It is dark, because it permits easy passage of the x-rays to the photographic film; the skull itself is light, because it holds back the x-rays.

In this case there is slight atrophy or shrinking of the right side of the brain, which has apparently caused no symptoms. Despite this atrophy, the patient has an intelligence above the average.

Such a procedure is of great use in cases in which the presence of a tumor, a scar, or degeneration of brain substance is suspected. Serious accidents are extremely rare. It has its drawbacks, however. The injection itself is often done under light anesthesia, as it may be painful. The air which remains inside the skull for several days often causes considerable discomfort. Because of these inconveniences, air-encephalography is employed only when it seems highly likely to yield information of practical importance.

### *The Brain-Wave Test (Electro-encephalography)*

About 1935 a new method of examination was found to be of considerable use in diagnosing the different types of recurrent seizures, as well as in determining the location of other disorders of the brain. This test is known as electro-encephalography. It is based on the discovery that during the processes of seeing, feeling, and other activities, the brain gives off minute electric currents.

By the use of an amplifying apparatus, something like a radio set, these currents can be picked up, recorded graphically on paper, measured for size (voltage) and speed or frequency, and studied for their significance.

Interestingly enough, the voltage and frequency of the brain waves vary according to

the conditions under which the brain is functioning at any given time. For example, sleep tends to slow them down, while activity increases the average rate. When the eyes are closed, slow beats at ten per second appear over the visual centers of the brain, to be suspended if the eyes are opened again.

When these waves are recorded graphically upon paper, certain types of activity produce typical patterns.

Of particular importance is the fact that some diseases tend to produce specific changes in these patterns or groups of patterns, which are typical for the disorder, so that a study of the brain waves of a patient frequently helps in determining the best treatment for his particular case.

Picking up these waves from the brain is a simple procedure for the patient. Not only is it painless, but it is usually found to be rather interesting. The waves are picked up by holding a small wire, similar to the aerial of a radio set, against the head or scalp, while the other end of the wire is attached to an apparatus which looks like a radio. Radios pick up, by means of aerials, waves which are broadcast from a distance. The electro-encephalographic machine picks up brain waves. Both sets of apparatus amplify the waves so that they may be observed. In addition to this, the patterns of the brain waves are drawn on a strip of paper with an ordinary writing pen.

Children often enjoy the fact that their heads can write messages on paper by means of these "aerials," much as their hands can, except in a different "language." (*see* Figures 5, 6)

The wires used in this way are called electrodes. Sixteen or more may be used at one time. They are simply held against different parts of the scalp by a bit of adhesive tape or collodion. The pens automatically start writing the waves when the machine is turned on and the paper begins to move.

The actual voltage or strength of these electric currents is of course exceedingly small. To compare it with something familiar, the usual current in the lighting system of a house is 110 volts. Brain waves are measured in terms of microvolts. One microvolt is equivalent to one millionth of a volt. Ten to fifty microvolts will usually cover the range of the brain waves recorded by most electro-encephalographic machines. The greater the height—or amplitude—of the wave, the greater the voltage.

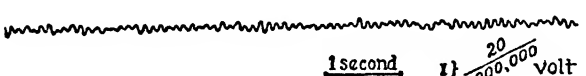


*Fig. 4.* Normal electro-encephalogram. The tracing is taken on a strip of paper moving from right to left by means of a pen actuated by an electromagnet (see Fig. 5, p. 46). The horizontal line represents one second of movement of the paper; the vertical line represents deflection caused by a potential of 20 millionths of a volt (20 micro-volts). This record is taken of a person who has never had seizures.

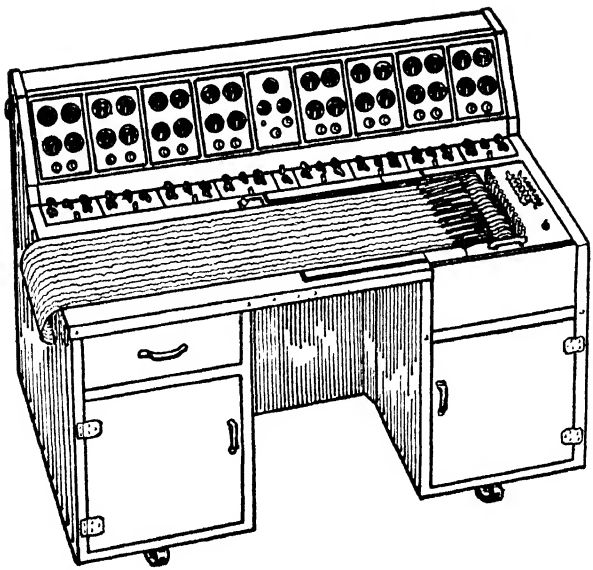

*Fig.* 5. One of many types of apparatus used for electro-encephalography. The paper is moved by a motor at a constant speed of about an inch and a half a second. The pens are fine tubes which conduct the ink to the paper. They are moved across the paper by means of an electromagnetic mechanism, so designed that the range of movement is proportional to the voltage of the current flowing. In this particular apparatus, sixteen pens record simultaneously.

The changes in the electrical potentials of the brain are picked up by small metal electrodes pasted to the scalp through a part in the hair (see Fig. 6, p. 67). The potentials are passed through two sets of amplifiers, which magnify them up to a million times. This furnishes sufficient current to move the pens.

Examples of the resulting curves or tracings of the brain waves, and how they are used in diagnosing different forms of seizures, may be seen in Figs. 4 and 7-10, pp. 65, 69, 70, 71, and 72.

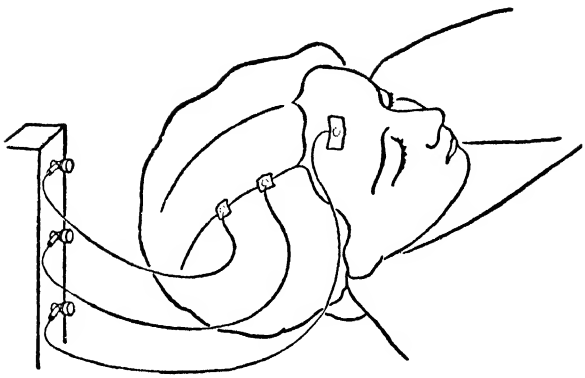

*Fig. 6.* Although the name "electro-encephalography" is long, the above diagram shows what a simple process it is for the patient. Electrodes—small wires with a metal button on the end—are held on the scalp with adhesive tape in order to secure a record of the brain waves—electrical currents given off by our brains. (Sometimes collodion is used rather than tape.) The electrodes are moistened with a special jelly to diminish the electrical resistance of the skin. The number of electrodes varies; it is usually 6 to 16.

It is essential for the patient to relax and close his eyes in a dim room, as movements of the muscles of the eyes, face, and jaws, cause much larger currents which disturb the record. The room has to be covered with wire netting, to exclude stray currents, radio broadcasts, etc. The electrodes pick up electrical currents generated by the brain; no current passes in the other direction, i.e., from them to the patient. It is just as painless as taking a photograph.

Under each of the wave patterns shown in Figures 4, 7-10, the measure for twenty or fifty microvolts is given. The horizontal measure shown for one second represents the distance

the paper travels in one second of time. Thus, there are usually ten or more waves per second.

During the recording, the subject should relax in a dim room with his eyes closed while the waves are being led off, in order to eliminate the large electrical discharges which are produced by the muscular activity of the eyelids, jaws, and muscles of the neck.

### *Normal Brain Waves*

The record of a well person when taken in this way usually looks something like the tracing shown in Figure 4. Actually differences in pattern occur, which are more or less characteristic for each individual. Such a regular pattern is called a normal electro-encephalogram (graphic record of the electric waves produced by the brain of a normal or well person). This normal record is not constant, however; it becomes much slower and more irregular during sleep, and faster and higher at times of excitement. The record is apt to be slow in infants, and the rate increases during maturity.

### Grand Mal

While there is considerable variation in the normal pattern of brain waves, certain abnormal rhythms may be definitely recognized.

A *grand mal* attack is usually accompanied by an increase in the height and number of

waves per second or a change in the rhythm (*see* Figures 7 and 8).

Such a record as that shown in Figure 7 is difficult to secure, as a patient is usually not near an electro-encephalographic machine when an attack occurs, and by the time the electrodes are placed the attack has usually subsided.

This one happened to occur while the test record was being taken. Since the attack did

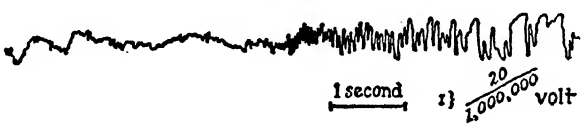


*Fig. 7. A* major seizure (*grand mal*) (Case 9). The patient, a girl of 19, unexpectedly had a major seizure with unconsciousness and convulsive movements while the record was being taken. The onset of rapid, high-voltage fluctuations marks the beginning of the seizure. She had not had treatment up to this time.

not involve muscles of the face and neck at the time, a good record was secured.

Such an alteration in the pattern of the wave as that seen in Figure 7 is practically always recorded when the electro-encephalogram is secured during a *grand mal* attack.

Between the attacks, there may be smaller disturbances or changes in the speed and voltage of the same general type. Note the fast high waves at the center of the record shown

in Figure 8. While this particular type of faster wave is rather uncommon between attacks, *bursts of abnormal* waves of some type (for

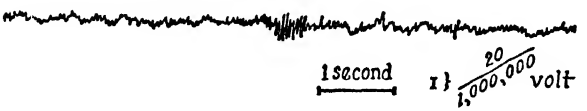


*Fig. 8.* Abnormally rapid activity between attacks is sometimes found in patients subject to *grand mal.* This girl of 21 years has had only three definite major seizures in six years. Brief periods of rapid, high-voltage activity occurred frequently in the electro-encephalographic record, although she gave no external signs of them. She has been free from attacks since taking treatment (Case 10).

example, like those to be described below) are usually to be found in cases of *grand mal.* If bursts of rapid activity are found, it is extremely likely that *grand mal* attacks will occur.

## Petit Mal

An electro-encephalographic record of *petit mal* attacks is fairly easy to secure, as they often recur many times an hour. A *petit mal* attack in general manifests itself by a series of alternating abnormally fast and abnormally slow waves, forming a "spike and dome" pattern like that depicted in Figure 9.

During the time of occurrence of such abnormalities, there is usually a slight wandering of attention or slowness of thought, even

though no definite attack is able to be noticed by any observer. If the patient is reading a book, he is apt to forget the paragraph he has

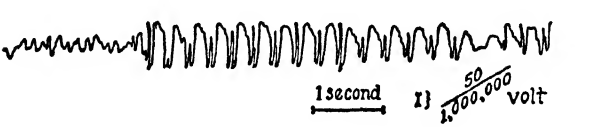


*Fig.* 9. A minor (*petit mal*) seizure (Case 11). A boy of 19 began having seizures nine months before this record was taken. Five of the seizures have been of the *grand mal* type, but there have been many brief periods of disturbance of consciousness (*petit mal*) at more frequent intervals. The one that occurred as this record was being taken was so slight that no external evidence of it was visible. Note the "spike and dome" pattern which is typical of *petit mal.*

just finished, and may have to read it again. A child in school will usually miss a few seconds or minutes of what is going on, and for this reason seem retarded or inattentive, during bursts of abnormal waves.

### *Psychomotor Attacks*

Psychomotor attacks are often associated with abnormally slow waves. Electro-encephalographic records taken during or between such attacks frequently show groups of these slow waves with broad tops, like those in the right-hand portion of the record in Figure 10. They resemble *petit mal* complexes, and often alternate with them.

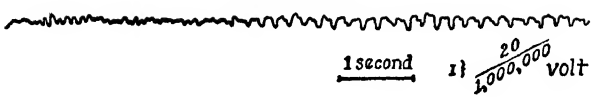


*Fig. 10.* This pattern is suggestive of *psychomotor* attacks (Case 12). The patient, a 20-year-old boy, sought medical aid because of outbursts of uncontrollable temper of which he later had no memory. During one of these, precipitated by a trifling discussion, he started a riot between two college fraternities. On another occasion, he drove several miles and passed several red lights with no memory of what had happened. The slow, square-topped waves seen in this record are frequently found in such cases. The patient was apparently relieved of his attacks when last seen.

Patients who have a tendency to seizures may voluntarily produce such waves in their electro-encephalographic record by breathing very much more rapidly and deeply than usual. This changes the carbon dioxide content of the blood, in such a way as to make the brain more irritable. Latent abnormalities in the brain waves may also sometimes be brought out by other procedures. One is to put the patient to sleep by means of some ordinary sedative. This seems to provoke certain abnormal discharges, especially those associated with small scars of the brain. It is also useful in obtaining records in babies and young children who do not understand the necessity of relaxing during the test.

Other maneuvers sometimes employed to bring out abnormalities include flashing a light in the eyes at a rate of ten flashes per second,

and the injection of minute doses of certain medicines which tend to accelerate the rhythm of the brain waves.

### *Practical Importance of Electro-encephalography*

A recording of the brain waves may confirm a doubtful diagnosis. A tendency to convulsions (idiopathic or essential epilepsy), is apparently not a disease in the ordinary sense of the term, but rather a disturbance of the rhythm-regulating mechanism of the brain. It has been called a dysrhythmia (Lennox); that is, a condition in which abnormal rhythms prevail. Dysrhythmia has been found in about 80 per cent of patients suffering from seizures, and in about 10 per cent of apparently normal persons examined.

The brain-wave test is also often helpful in showing the presence and location of scars, tumors and abscesses, and thus guiding surgical treatment. Brain-wave records may be taken from the exposed brain during surgical operations. The procedure has been of use in defining and classifying seizures and in showing the effects of various bodily states and of medical and surgical treatment upon them. It has made possible an understanding of certain curious symptoms apparently allied to seizures; for example, the periodic dullness mentioned on page 48, the digestive upsets sometimes seen in infants as a variant of seizures, and certain dis-

turbances of behavior, especially in children. The study of the heredity of the tendency to seizures has been put on a far more definite basis by its employment. In Chapter 10, more will be said about its usefulness in relation to the problem of marriage of those subject to seizures.

During the last decade, a new and important practical use of the brain-wave test has been developed. In cases in which seizures are difficult to control, it is possible to make a fairly accurate choice of the best of the various medicines available, by studying the effect of each on the brain-wave pattern. This method will be described further in Chapter 7.

Sometimes the pattern of electro-encephalograms is improved by treatment, though sometimes not, even when the observable attacks or convulsions may be held in abeyance. Brain rhythms usually grow more stable with age. While some physicians use electro-encephalography constantly, and feel that they gain an insight into the patient's condition by means of it, others do well without it. Its value is considerable in puzzling cases in which the diagnosis is in doubt, sometimes also in cases which do not respond to conventional methods of treatment.

## How to Help Your Doctor Help You

Write out a neat, complete but concise history of your case.

Keep a record of attacks, and the medicines you take, showing any variations in routine.

Keep track of any "aura," or warning signals, which may assist the doctor in diagnosing, in knowing how to prevent, or how best to care for attacks.

Take the medicines prescribed, etc., with absolute regularity (always the same dose per day).

Be extremely moderate in the use of alcoholic liquors.

Exercise until your muscles are hard and strong, and stay fit (unless your doctor advises otherwise).

Report any headache, disturbances in vision, undue drowsiness, changes in the gums, skin rashes, or other unusual occurrences.

CHAPTER FIVE

# What the Patient Can Do to Help

CHAPTER 4 described some of the methods and complicated apparatus available to doctors for studying the individual differences and needs of each patient. Obviously, before adequate treatment can be given, it is important to know what the characteristics of the particular case may be.

Much, however, depends upon the cooperation of the patient himself, and of the family. The doctor must know a great many things which only they can tell him. There are several ways in which they can be of assistance.

## *Description of Attacks*

Frequently, the most important part of the story of any illness is a description of how it began, what happened just previous to it, and how it progressed. Sometimes, too, a doctor

would like to know of facts and events which it has not occurred to the patient to mention. A list of important questions and points to be covered is given in Chart 1, page 81. A careful record of this type is invaluable to the doctor as a starting point.

*Carrying Out the Treatment Prescribed*

There are some illnesses in which omission of a dose of medicine is no serious matter, but epilepsy is not one of them. It is extremely important that the medicines prescribed be taken with absolute regularity. Skipping even part of a dose one day may be followed by a seizure the following day.

Usually the patient himself rather than some other member of the family should take the responsibility for his medicines. He is the one who will suffer from errors, as he will sooner or later learn. Even young children can be trained to follow the prescribed routine, and they enjoy the grown-up feeling of meeting their own problems in a grown-up way.

A useful trick to aid in remembering to take medicines regularly, is to procure a plastic box divided into compartments. A suitable one, sold at most hardware stores, measures about four by eight inches and has eighteen divisions. Starting at the upper left-hand corner, each compartment in succession is labeled with the initial of one of the days of the week, ending

with the left-hand end of the middle row. Then starting with the left-hand lower corner, the lowest row is similarly labeled, ending with the right-hand end of the middle row. Thus, in these compartments, a fortnight's supply of medicine may be laid out in advance. If the box is kept on the bathroom shelf, all the family can see whether the day's dose has been taken. If it is forgotten one night, it should be taken the following morning.

Regularity in other routines of life is important also—regular meals, regular hours for going to bed and getting up, plenty of sleep. Most doctors advise against the use of alcohol, except perhaps a glass of wine or beer with meals.

Naturally, the patient should be scrupulous about exercise as prescribed by the doctor. Special care of the teeth may be required. More will be said about these precautions in Chapter 7.

### *Reporting any Evidences of Unusual Responses to Medicines*

The actual dosage of medicine required to control seizures varies from case to case, and must be adjusted to fit the patient's individual problems. For this reason there are certain evidences of overdosage or underdosage which should be reported at once to the doctor, such as headache, disturbances in vision, undue

drowsiness, changes in the gums, skin rashes, or any other occurrences which seem unusual. He can then tell how to modify the treatment to meet the particular needs of the case.

### *Keeping a Record*

Some form of record should be kept to show to the doctor at intervals as treatment progresses. A simple type of chart for cases in which attacks are frequent is shown in Chart 2, page 85, and Chart 3, page 94. Either is satisfactory. In the case of a child, a chart may be kept by the parents.

Since the successful control of seizures often depends on taking advantage of many small gains, the physician can work more rapidly and efficiently if he has a record before him at each visit. It soon becomes obvious whether the dosage of a given medicine should be increased or decreased, whether the patient is taking enough exercise, and so on.

If there is any question of sensitivity to food or to particular occupations, these too should be noted on the chart. Naturally, any evidences of overdosage, such as the symptoms mentioned in the last paragraph, will easily find their place here. Experience shows that the precise relationship of details which may make all the difference between success and failure cannot safely be entrusted to memory.

There may be some exceptions to this rule

(as to most). Some people find that keeping a record tends to fasten their minds on the attacks. A person who grows anxious or moody over the matter may do well to give it up after a reasonable trial. Relief from the seizures is of course an even better reason for giving up a diary about them.

### *Help Others, Too*

All epileptics and their families should do their best to understand the situation as it affects the public and other sufferers. Learn of the facilities for care in your community; support them by encouragement and financial contributions; help as you can in their operations and their drives for funds. Join one or all of the national organizations, and the most active of the local ones. Help to combat the public prejudices concerning epilepsy. Watch for pending legislation bearing on the subject; campaign for more liberal laws, better facilities for treatment.

Further suggestions along these lines will be given in Chapter 9.

### CHART 1

*History Form for Cases of Suspected Epilepsy*

Write it out in your own words, taking as much space as needed under each heading, for a concise summary.

1. Give your name, age, address; approximate weight and height; date of preparation of record. Married or single? Children?

2. Are your parents living? If so, do they suffer from any chronic disease? If so, what? If either or both are deceased, what was the cause of death?

3. Have you any living brothers or sisters? If so, do any of them suffer from any chronic disease? (specify which, if any). If any have died, give cause of death.

4. Try to recall all of your near blood relatives whom you have known or known about. Did any of them suffer from convulsions, fainting attacks, spells, sick headache, tantrums? If so, describe the illness briefly.

5. Were you born by a normal delivery? If not, describe any abnormalities such as prolonged labor, instrumental delivery, artificial respiration, etc.

6. Were you considered a normal baby?

7. Have you suffered any head injuries with unconsciousness? If so, give approximate date and describe your course.

8. Have you had any severe infectious diseases accompanied by unconsciousness, convulsions, or paralyses? If so, give approximate date and describe your course.

9. Have you ever been subject to fits of rage (tantrums)?

10. When did your seizures begin? What type were they? Describe a typical one, or typical forms if there are several types. Did

anything unusual happen to you prior to the first seizure?

11. Make out separately a list of all the seizures you have had, indicating the type of each. If they have been extremely numerous, a chart, or an estimate of the number per year, month, week or day will suffice.

12. Do you suffer from severe headaches? If so, describe.

13. Have you ever injured yourself during an attack? If so, describe briefly.

14. What doctors have you consulted for this disorder? Have you attended a clinic or been a patient in any hospitals? Have you had one or more brain-wave tests? Pheumo-encephalograms (air studies)? Other special tests? Give addresses as needed to facilitate getting copies of old records.

15. What medicines have you taken? Make out as complete a list as possible, giving the maximum dose of each, the period over which it was taken, and the effect.

16. Do you have any unusual emotional problems? If so, describe them briefly.

17. Do you experience hours or days when you are far less alert and intelligent than usual? Do these substitute for, or precede attacks?

18. Have you noticed any circumstances (such as gazing at a flickering light, listening to certain sounds, eating or drinking certain foods, fatigue) which seem to predispose to attacks?

19. Do your attacks come at any particular time of day?

20. Can observers tell you are going to have an attack? If so, how?

21. Have you any warning that an attack is coming? If so, what?

22. At the beginning of an attack, does one part of the body regularly begin to twitch or move before the rest? Do you turn your head to one side? If so, which?

23. Is there a cry at the beginning of the attack? Is there incontinence of urine or stool or frothing at the mouth or biting of the tongue during the attack?

24. Do you have a weakness in one arm or leg or one side of the face after an attack? Any unusual sensations?

25. Is your speech disturbed just before or after an attack?

26. Is there any difference in your behavior before or after an attack?

27. Describe in detail the order of events in the attack.

28. Are you sleepy after an attack? Does your head ache? Do your muscles ache?

29. What are the most serious effects the attack has had upon your life?

CHART 2

*Chart of Attacks*

Name: Miss B—— K—— Month: February

Year: 1942; Age: 15; Major attacks: x; Minor: o

| Day | Attacks | Remarks | Treatment |
|---|---|---|---|
| 1 | | | Continuing 1½ gr. phenobarbital and 3 gr. phenytoin |
| 2 | oo | | |
| 3 | oo | | |
| 4 | oooooo | Menses | |
| 5 | ox | " | |
| 6 | oo | " | |
| 7 | | " | |
| 8 | | " | |
| 9 | oooo | " | |
| 10 | o | | |
| 11 | oxx | | |
| 12 | x | | |
| 13 | oox | | Gymnasium work begun |
| 14 | oooo | | 1½ gr. phenobarbital and 4½ gr. phenytoin |
| 15 | oo | | |
| 16 | | | |
| 17 | oo | | |
| 18 | o | | |
| 19 | oo | | |
| 20 | | | |
| 21 | | Cold | |
| 22 | | " | |
| 23 | o | " | |
| 24 | | " | |
| 25 | | " | |
| 26 | ooo | " | |
| 27 | | | |
| 28 | | | |

## How the Family and Neighbors Can Help

Realize that there is nothing in a seizure that can be of any danger to the onlooker.

It will pass shortly, and the patient will usually be able to continue his regular duties.

You may be able to help break the fall, and possibly apply a tongue-protecting pad between the teeth.

Your largest and most fruitful task is to help relieve any feeling of embarrassment, and to refrain from continuing the period of invalidism longer than the actual attack necessitates.

You also may be of great assistance in helping create the kind of situations which tend to prevent attacks, and in helping find adequate medical advice.

CHAPTER SIX

# How Bystanders Can Help

## *At the Time of the Attack*

THERE IS much that the family and neighbors can do. As a matter of fact, the actual care of any individual attack usually falls upon the family and casual bystanders, as the seizure is almost invariably over before a doctor could possibly arrive. How such a situation is met depends upon the understanding and resourcefulness of those who witness the seizure.

Unfortunately, there has been so little knowledge available to the general public in regard to the realities of the situation, that most people are taken by surprise. While one is wondering what to do, the attack subsides, and the onlooker is left to puzzle over his own feelings about the matter, or to be further confused by the superstitions passed on to him by some misguided soul.

Actually, a seizure is something which any one of us might have under circumstances of excessive strain, but which most certainly is not

contagious, and is quite painless to the person having it. Bystanders are in no danger; the patient will lie where he falls, and presently recover. Although seizures have sometimes been referred to as "fits," they do not resemble the "fits" usually thought of or possibly seen in animals, except that in either situation there may be a certain uncontrollable contraction of the muscles. A human patient with *grand mal* cannot run around, could not possibly attack anyone, and is not in any way harmful to touch.

As to treatment during the actual time of attack, there is none; the patient recovers by himself. Effective treatment given by doctors is between the attacks, not during them. There are, however, a number of things which can be done during a *grand mal* attack, if the onlooker can maintain a certain amount of equanimity.

### *First-Aid Measures*

First, a bystander may be able to break the fall, so that the patient goes down easily and does not lie against or too near a hard corner of furniture, steps, breakable objects, thorny bushes, etc.

Second, he may be able to put a pad consisting of a folded handkerchief or other soft, firm object between the patient's back teeth so that he does not bite his tongue by the contractions of his facial muscles. A detailed description of this is given in the next chapter (*see* page 98),

and a diagram demonstrating how it should be done may be found in Figure 11 (*see* page 99).

Third, he may be able to loosen the clothing —especially the collar, garters, belt, or anything which might constrict the circulation if pressed upon by the tightly contracting muscles. Hard objects might be removed from a small boy's pockets.

Fourth, he may help to reassure other bystanders who know less about the situation than he, and therefore are more disturbed. The situation actually is much more simple than it appears. It is harmless to others and painless (during the attack) to the patient.

Fifth. Perhaps the greatest contribution a bystander can make is to try to smooth over the situation during the time the attack is subsiding, and after it is over. Just what is done at this time depends upon the intelligence, the ingenuity, the protectiveness and the human understanding of those present.

A patient may come to consciousness with a strong feeling of embarrassment, keenly aware of the reactions of those about him, and deeply sensitive to any evidences on their part of a desire to shun or to ridicule him. Either of these reactions on the part of a bystander is caused by a lack of real knowledge and understanding, but the patient does not know that. Anything which will help to relieve the feeling of embarrassment—a matter-of-fact attitude about

the incident, a desire to help him slip into his usual routine of living as soon as he is able, and assurance of cooperation and encouragement to find adequate medical assistance in preventing further attacks—any of these is in order, and is usually sufficient to preserve the feeling of security necessary for a person subject to seizures to live a normal life.

What a member of the family or onlooker can do during a psychomotor attack varies entirely with the circumstances. It is usually determined by one's ability to realize quickly that the person is ill, rather than deliberately making a disturbance, and that punishments or too much restraint make matters worse rather than better. More is said of this in Chapter 9 (*see* page 137).

### *Keeping Records*

The family can be of considerable help to the doctor in numerous ways: by observing and keeping a careful record or description of attacks and of preceding and following events; by keeping a calendar record of seizures, if the patient is not old enough to do so; and by securing other pertinent information regarding childhood, etc. These form a vital part of the medical history (*see* p. 58) and help the doctor plan an efficient treatment. Samples of such records are given in Charts 1, 2 and 3 (*see* pages 81, 85, 94).

### *The School Problem*

In some states the diagnosis of epilepsy automatically bars a child from schools. In other communities children are excluded from summer camps if they have convulsions. In certain instances this attitude is entirely justified, for it may be most disturbing—sometimes a minor catastrophe—for a class to witness a convulsion. It is usually true that the teacher's attitude toward the convulsion determines that of the students. There are circumstances, however, under which a child who suffers only from nocturnal attacks or *petit mal* seizures, for example, may be able to continue in school without endangering the peace of mind of his fellow scholars. The diagnosis of "epilepsy" is usually made with caution, therefore, and the question of going to school should be settled on its individual merits in a given case, and after a fair trial of intensive treatment. A child who has learned to follow an effective regimen is ordinarily better off at school, and need cause no disturbance to the other pupils. Only rarely do the fatigue and excitement of school life seem to increase the attacks.

If attacks are not controlled, there are three alternatives: (1) to keep the child at home, giving him special instruction; (2) to send him to some school specifically conducted for the purpose (they are unfortunately few in num-

A Few Simple Rules about How To Raise a Child Who Has Epilepsy

Don't make an unnecessary invalid out of him.

Remember that he not only will have to stand on his own feet some day, but that he has an unusually heavy burden to carry.

Self-reliance, understanding, and courage will help him carry it, and will help to make it possible for him to live a normal life.

Help to create the kind of situation which prevents embarrassment or attacks, including a special school if advisable.

Seek help for your own mental attitude toward the situation if you need it.

Give him the responsibility for his own routine and program of preventive measures.

ber); or (3) in the case of older children, to arrange some form of wholesome, vigorous camp or farm life in the hope that time will bring recovery. Obviously, adequate treatment is more important than schooling.

### *The Problem of Other Children in the Home*

A tendency to convulsions in a child presents special problems if there are other children in the family. On the one hand, there is the ever-present tendency to pamper and spoil a sufferer; on the other hand, the peace of mind of the other children may be seriously disturbed by the symptoms and the precautions required to combat them. These difficulties are at a minimum if an effective form of treatment can be established, but while it is being instituted it is often preferable to have the patient out of the home. If no effective treatment can be found, it is a wise rule to think first of the healthy children. The advice of an experienced physician or child psychiatrist is of the utmost importance in most cases. The subject of the relationship of the child to his surroundings is further considered on page 137.

### *Should a Child Witness an Attack?*

Not if it can be judiciously prevented. There are obviously, however, times when prevention is not possible. In such situations, there are several principles to remember:

1. What children see or hear is not half so damaging to them as the attitude of others present toward the situation. In any moment of stress they alertly watch parents and others to

CHART 3

*Sample of an Actual Record, Prepared by the Patient's Mother*

Name: J—— S——

| | | |
|---|---|---|
| 1948 | Feb. 3 | Attack at school. Unconscious 5 minutes. Seen by school doctor who made several tests, and found impacted wisdom teeth. |
| | May 10 | Similar attack at school. |
| | Aug. 6 | Attack at home. Dr. H. prescribed phenobarbital when nervous and after attacks. |
| 1949 | July 2-21 | J's hands were "jumpy" on several mornings. |
| | Aug. 1 | At 8 P.M. a severe attack when tired after a particularly hard day. |
| | Oct. 12 | Similar attack. |
| | Dec. 7 | Attack at breakfast. |
| 1950 | Jan. 14 | This morning after a night of much excitement, drinking some wine, was "jerky" for a few minutes. Slept 2 hours, had an attack; slept; was "jerky" when she awoke. |
| | Mar. 15 | Began taking phenobarbital regularly, 1½ gr. morning and night and has had no attacks since, but feels somewhat sleepy. |

see how the incident affects them. Almost immediately they take over as their own the emotional reactions of those around them toward any given situation. They are capable of showing an amazing equanimity, lack of fear, and adult common sense and judgment, if among the older people present there are a

matter-of-fact attitude and a willingness to explain in simple terms.

2. Children want to know and to understand things going on about them. If reasonable answers are not given, they make up their own. This is one of the ways in which superstitions start.

3. They should be protected from seeing strong grief or fear, or having their sympathies greatly aroused toward situations which they are powerless to help. They want very much to help, and too great feelings of inadequacy are harmful to them.

4. One helpful attitude toward seizures in the presence of children is much like that toward an accident at the table—it should be regarded as something to be taken care of, a sensible plan for future prevention should then be made, and the incident forgotten.

### Is there Effective Treatment?

For the majority of patients—yes.

As high as 75 per cent of cases are maintained seizure-free by medical treatment in some clinics.

More has been learned about seizures and their treatment in the last twenty years than in all time previously, and promising investigations are in progress. Each case requires individual study and often a persistent trial of various types of treatment to find an effective one.

CHAPTER SEVEN

# Principles of the Treatment of Individual Seizures; The Use of Medicines

## *General Considerations*

WHILE IT IS usually an advantage for the patient to have a conception of the problem which faces him, and to understand in general how his physician goes about trying to help him, it is clear that decisions in regard to treatment must be made by the physician in charge, guided by what the patient reports. For various reasons, self-medication is particularly dangerous in a disorder as insidious as the one we are considering. In any case, knowledge gained by reading is a poor substitute for experience and a wide base of medical training. It is well to remember the caution given by Oliver Wendell Holmes to a patient whom he found reading up on his illness in a medical treatise: "Be careful, or some day you'll die of a misprint."

This chapter above all others is written to

help the patient help his physician, and should not be construed as directions for self-treatment.

### *Treatment of Individual Attacks*

Many seizures, for example *petit mal* and brief psychomotor attacks, need no particular treatment during the attack itself. This is true of most major attacks also; they are self-limited, and the patient recovers rather rapidly, often bruised or embarrassed, but seldom actually hurt. If he has any forewarning, he naturally seeks a sheltered and safe position. Bystanders may be helpful in catching him to break the fall, opening the collar, and standing by to give assistance during the period of recovery. The advice is often given to place a pad in the mouth, to prevent the patient from biting his tongue. This is a wise move only if a soft but firm object—such as a folded handkerchief, a stout roll of paper, or a corner of a magazine—can be inserted between the back teeth on one side (*see* Figure 11, page 99). The front teeth are easily broken. Naturally, fingers should never be risked in the mouth of a patient having a convulsion. In case of doubt it is better to do nothing, as a bitten tongue is temporarily unsightly and painful rather than serious.

Following the seizure, a period of clouded consciousness or of some irresponsibility may occur. Some psychomotor attacks consist only of

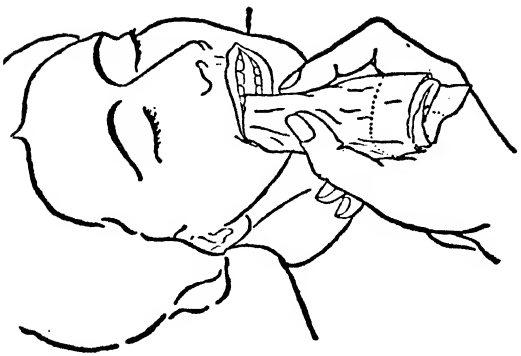

*Fig. 11.* The doctor or bystander placing a pad between the back teeth of an unconscious patient, to prevent her biting the tongue. Illustrated is a man's handkerchief, folded, but any object that is of the right size and not too hard will do—for example, a small purse, a stick of kindling wood, a pair of gloves, etc. The object should be large enough so that there could be no possibility of swallowing it. Do not try to open the mouth; wait until it opens spontaneously. Be sure the pad is between the *back* teeth; the front ones are easily broken. If one side of the jaw is kept open, the tongue is relatively safe.

periods of irrational behavior, of which the patient has no memory. Extreme tact and resourcefulness are essential in managing such a patient; he is apt to become more obstreperous if hindered or restrained. Unless obviously completely recovered, he should be placed under a doctor's care, often best in a hospital.

Certain patients learn peculiar tricks which seem to abort their own attacks—for example, squeezing or rubbing the extremity in which the attack begins, holding the breath, or "ex-

erting the will." No generally helpful advice can be given in this regard. A person who is likely to have seizures should carry with him an identification card, with his name and address, his type of illness, the name and address of his physician, and directions telling what to do and whom to notify in case an attack occurs.

### *The Course of Untreated Cases*

Even before modern methods of treatment were available, it was known that spontaneous recovery from epilepsy might take place, especially in early life. A century ago, medical observers reported the recovery rate at 13 per cent of untreated cases.

How and why this occurs is not known. Possibly the "convulsive threshold" varies spontaneously, again possibly a temporary local irritation of the brain occurs and disappears. I myself know of two personal friends, each of whom had a single seizure twenty-five years ago, and none since. It seems clear, however, that having convulsions increases the tendency to have them, and that preventing them promptly by medical or surgical means increases the likelihood that proper treatment will keep them in abeyance indefinitely.

### *Treatment with Medicines*

The greatest single advance in the treatment of epilepsy has been the introduction of specific anticonvulsant medicines. It appears likely that

at least some of them are chemically akin to substances normally produced in the body, which may have the function of stabilizing the action of the brain. Their use might therefore be likened to the employment of insulin in the treatment of diabetes. Few patients can become or remain seizure-free without the use of medicines, no matter what additional forms of treatment are employed. In the relatively rare cases in which surgical procedures are undertaken for the relief of epilepsy, the patients usually have to continue taking medicine after operation.

Certain general principles apply to all forms of medical treatment. The first is that it is usually essential for the patient himself to appreciate the problem which confronts him, to understand at least in general terms the nature of the affliction, and to take full responsibility for the rigorous fulfillment of the routine evolved for him by his physician. With adults, the necessity is obvious, or becomes so, but the principle is sometimes difficult for parents to apply to children. Sooner or later the child has to face it, however, and the results are usually better and emotional tension usually less after the adjustment is made. The success of the modern treatment of diabetes depends chiefly upon the patient's acquisition of expert knowledge and his determination to apply it, and the best results in difficult cases of recurrent seizures have been obtained in the same way—

needless to say, always under a doctor's supervision in either case.

Another important principle is that any anticonvulsant medicine must be taken regularly to be effective. If it is forgotten one day, an attack—or even a group of them—is particularly apt to occur, as if dammed up and suddenly released. All anticonvulsant medicines may at times produce disagreeable symptoms, such as skin rashes, drowsiness, and depression. If the toxic manifestations are severe, the dose may have to be reduced, but it should not be entirely omitted. In changing from one medicine to another, the two should overlap for three days at least, to avoid symptoms of sudden withdrawal. If the patient suffers an acute illness or accident, or goes into a hospital for operation, some provision should be made to insure that his medicines are given regularly.

Some patients are prone to be dull and forgetful when an attack is imminent. If such a person neglects to take his medicine under the circumstances, the results may be disastrous. Precautions should be taken against this contingency—for example, the use of a compartment box, as described on page 78.

### *The Question of Habit Formation*

There is no reason to believe that any one of the medicines discussed here is habit-forming, in the sense that a craving for it develops with use. Many patients find they cannot get along

without the medicines, but that is another matter. A certain patient, for instance, daily for twenty-five years took phenobarbital in as large doses as she could tolerate. She changed to another medicine at the end of that time with no sense of loss—indeed, with a feeling of relief. Many such examples could be cited.

It is curious how many people shy at the idea of taking an anticonvulsant regularly, yet feel themselves dependent upon a cup of coffee in the morning or a package of cigarettes a day. The group of substances about to be described are far less likely to form a habit than are caffeine and nicotine. Possibly the aversion which some patients have toward taking medicines is an expression of an unwillingness to face the fact of illness.

There are many effective anticonvulsant medicines. The most widely used of these are described in the next few pages. Others are under investigation, and are likely to appear on the market soon.

### *The Bromides*

For three-quarters of a century, the bromides have been used for the treatment of convulsions, and indeed of practically all other diseases of the nervous system. At one time they were the most widely employed of all medicines, and were used literally by the ton at many hospitals. They are still useful, but have been largely supplanted by other medicines.

There is no appreciable difference in effectiveness between the various salts of bromine. Sodium bromide in tablets is the cheapest form, and the standard, though others are perhaps a little easier for some people to take. The dosage is determined by a physician to fit the individual patient. The most accurate way of doing this is to determine chemically the amount of bromine in the blood from time to time. This is not essential if small doses are used. Any dose is more effective if the patient takes a low-salt diet.

All the bromides are rapidly absorbed (usually within an hour). They are eliminated rather rapidly at first so that doses have to be taken about every eight hours, occasionally oftener. The rate of excretion slows down after about four hours, and a proportion of each dose remains in the body for several days.

The patient and those around him should be alert for symptoms of overdosage, which may develop insidiously. The commonest is a skin rash, usually pimples about the nose, worse in warm weather. Scrubbing the skin with soap and water is helpful. There are certain medicines which have some tendency to prevent the eruption.

More serious is the drowsiness and depression which bromides are apt to cause, particularly in children. An obvious remedy is to cut down the dosage. Occasionally, a patient will

rather suddenly develop a delirium or peculiar delusional ideas as a result of taking bromides, and may even have to be restrained until proper treatment (administration of liquids and table salt) can be given. Recovery practically always occurs, and the patient is no worse for the experience.

### *Phenobarbital and Similar Medicines*

Phenobarbital is the official name for a medicine, which is often called Luminal, a trade name owned by the original manufacturer. Other trade names are Gardenal, Luvasyl, etc. In England the official name is phenobarbitone. It is a synthetic drug, which has been in use for about forty-five years, so that its habits and characteristics are well known. It was originally designed to be a hypnotic (sleep-producing) drug, and its action on convulsions was discovered quite by accident.

Phenobaribital was regarded as the standard anticonvulsant until the introduction of phenytoin (*see* below). It is usually more effective and less depressant than the bromides, and is successful in a considerable proportion of cases (especially of *grand mal* seizures). Incidentally, it is the cheapest anticonvulsant if purchased under its official name in packages of 1,000 tablets of 1½ grains. Naturally, a doctor's prescription is required. If a moderate dosage of phenobarbital is adequate in a given case,

and its use is not accompanied by drowsiness, dullness or depression, there may be no need for looking further.

The physician usually determines the dosage of phenobarbital by the individual patient's susceptibility to its sedative effect, which varies. It is relatively easy for the patient to judge when he is taking too much. There is less danger of cumulative action than with bromides, and far less danger of skin eruptions, which may, however, occur. Phenobarbital occasionally produces irritability or an increase in psychomotor outbursts, or tantrums, particularly in cases of predominant *petit mal*, so that other types of medicine are usually preferred in such cases.

Mephobarbital (Mebaral, Prominal) is chemically related to phenobarbital. It is somewhat less depressing, and seems to be more effective against *petit mal* attacks. In these respects, it is usually found to be intermediate between phenobarbital and phenytoin (*see* below). It is often used in combination with one or the other.

Phenylmethylbarbituric Acid (Rutonal) is a preparation with similar characteristics.

The dosage and symptoms of overdosage of these two medicines are similar to those of phenobarbital.

The medicines of this group are usually completely absorbed within two hours from the time they are taken, and completely excreted

within twelve hours. There is some advantage, therefore, in giving several doses a day, and planning a dose to be given about two hours before the usual onset of attack, if they tend to come at any special time of day. Most "epilepsy cures" contain phenobarbital, often in enormous doses—far larger than most physicians are willing to employ.

Primidone (Mysoline) is a new medicine of the phenobarbital group, which often seems to be more effective and less sedative and depressing than the others. Its chief limitation is its tendency to produce drowsiness, however.

### *Phenytoin Sodium and Similar Medicines*

Phenytoin sodium is the official name of an anticonvulsant which is often known by its trade name of dilantin sodium. It is also called Epanutin in England, Epamin, Epelin, and Hydantal in some other countries. It was the first product of a new approach to the subject of convulsions; namely, a direct experimental search for effective substances with a minimum of undesirable properties. Although many new medicines have been evolved by similar methods since then, phenytoin is still probably the safest and is among the most effective. If given in proper dosage, it produces an improvement in over half of the cases unrelieved by phenobarbital. A great advantage over the older anticonvulsants is that it seldom produces drowsiness. It is effective in some proportion of

cases of all types of seizures, but most effective against *grand mal* and psychomotor attacks.

Even in the hands of experienced physicians, the dosage of phenytoin sodium is much more difficult to adjust than that of phenobarbital. There is a great range of tolerance to it. In general, patients who are already taking phenobarbital should continue to take it until they are well established on phenytoin sodium. The latter is usually given in doses of one or two capsules (of 1½ grains or 0.1 grams) daily, at first, and the dose gradually increased at intervals of a week until an effect is obtained. The average dose is usually stated to be three capsules daily, but most specialists prescribe substantially more. When the seizures are controlled, the dosage of phenytoin sodium is held constant. If disagreeable symptoms occur, a little less is given. The phenobarbital may be gradually reduced or even omitted as an adequate dosage is approached. Up to 9 capsules of phenytoin daily have been given, but this is unusual. In individual cases there may be reasons for varying this routine, which is suggested merely as the usual one.

It is important for the patient as well as for the doctor to be familiar with the disagreeable symptoms which phenytoin sodium may produce. They are far more varied and surprising than the drowsiness which announces overdosage of phenobarbital. Any unexpected change should be reported at once to the phy-

sician in charge. An immediate reaction to taking phenytoin sodium may be a sense of nausea and burning, due to the fact that the substance is extremely alkaline. This may be helped by taking the capsule between the courses of a meal. Sometimes medicines to increase the acid in the stomach are prescribed by the physician, or the neutral form of phenytoin, suspended in oil, may be used (dilantin in oil).

More common are the symptoms of dizziness and headache which are apt to come on a few hours after the first dose. The dizziness may be so extreme that the patient has difficulty in getting about, but this condition rarely lasts more than a few days, especially if the dose is reduced slightly. A little persistent giddiness is nothing to fear, and had best be endured if a reduced dosage does not control the attacks.

A fever and rash which may be mistaken for measles is commoner as a result of phenytoin than as a result of phenobarbital—especially in children. If the dose is decreased by half, the rash usually clears up. The full dose may then often be resumed.

Overgrowth of the gums occurs in a small proportion of cases, especially in children with inflamed gums. It is not serious, and has no relation to vitamin deficiency, as has been fancied by some. Frequent trips to the dentist are advisable. The condition may be held in check by scrupulous cleanliness of the teeth and vigorous massage of the gums twice daily,

either by means of the little rubber prong (interdental stimulator) with which some toothbrushes come equipped, or by rubbing them briskly between thumb and forefinger. Dentists sometimes remove the excess tissue. If the condition persists in spite of vigorous treatment, a change to another type of medicine may have to be made.

A number of other miscellaneous symptoms have been ascribed to the use of phenytoin, but many of them are probably coincidental rather than a result of the medicine. In case of doubt, it is wiser to reduce the dose gradually, and then try raising it to an effective level again when the symptom has subsided. Here again, the advice of a physician is essential.

A small proportion of patients are unable to take phenytoin continuously for one reason or another. Two measures are worth trying for the purpose of increasing tolerance: vigorous exercise (which will be discussed below), and an increased intake of liquids. In some cases, antihistaminic and antiallergic medicines (such as cortisone) are helpful, especially with skin eruptions.

It should be emphasized that, though the symptoms mentioned are annoying, they are practically never dangerous. Serious complications from the use of phenytoin sodium are far rarer, even in proportion, than they are from the use of most of the other anticonvulsants, including phenobarbital and the bromides.

Enormous overdosage—up to one hundred capsules a day—has been reported in several instances, without permanent effect. Indeed, massive doses—the equivalent of forty capsules a day—are used in the intensive or narcosis treatment, as will be described on page 119.

Phenytoin sodium is more slowly absorbed and excreted than other anticonvulsants, so that a fairly constant level may be obtained, even if the full dose is taken at one time (usually at bedtime). This is true of the other medicines of the same series.

Phenantoin (Mesantoin) is chemically related to phenytoin, but it is slightly more sedative, sometimes more effective. The bizarre symptoms occasionally produced by phenytoin, such as overgrowth of the gums, and rashes, are much rarer with phenantoin. On the other hand, some dangerous effects on the blood-forming tissues have been reported, so that it is customary to have blood counts taken monthly on all patients who are given phenantoin. This is true also of all of the following medicines, in the present state of our knowledge.

Tetrantoin (Spirodon) is a new drug of the same series as phenytoin. It is about as effective in about the same proportion of cases, but as must by now be clear, some patients do better on one, some on the other. Rashes, dizziness, and drowsiness may occur. Serious disorders of the blood have been reported, so that monthly blood counts must be made.

Peganone is a new medicine of the same general type, which as yet has not been widely used.

Trimethadion (Tridione) and paramethadione (Paradione) are two similar medicines, chemically in a class by themselves. Their greatest effectiveness is in the control of *petit mal* attacks, or others associated with a slowing of the brain waves. Some doctors feel that the use of either of these medicines may tend to produce *grand mal* attacks, and for this reason give phenytoin or one of that group in addition.

The dosage of these two medicines is sharply limited by a curious symptom, namely a sensitivity to bright lights. This may be helped by the use of dark glasses. A close watch must be kept for any evidences of decrease of the number of white blood cells.

Phensuccimide (Milontin) and methsuccimide (Celontin) are two new medicines of still another chemical type. The former seems valuable in the treatment of *petit mal,* the latter in the treatment of psychomotor attacks. Their precise place in treatment is not yet firmly established, however. They have a slight tendency to produce drowsiness and rashes, but so far, no serious complications have been reported.

Phenacemide (Phenurone) is a unique medicine in many respects. It is sometimes effective in controlling attacks of all types when others fail. On the other hand, it may produce a great

variety of disagreeable, even dangerous effects. One of the most distressing is a deep emotional depression, sometimes accompanied by peculiar —even fantastic—fixed ideas. Physical disorders may appear also, including jaundice, and depression of the blood-forming tissues.

Acetazolamide (Diamox) is unrelated to any of the above substances, and is not in any sense a sedative. It helps to regulate the acid-base equilibrium of the body, and this seems to increase the effectiveness of practically all anticonvulsants in some cases. It is therefore seldom used alone. Toxic effects have been reported, so that monthly blood counts are usually required.

In addition to the medicines listed here, several others are under study in laboratories and special clinics. Some of them will be described briefly in Chapter 10.

### *The Choice of an Anticonvulsant*

This is sometimes easy, sometimes difficult. Most doctors become familiar with one of the safer medicines, such as phenytoin or phenobarbital, and prescribe it in small doses as soon as the diagnosis is clear. The dose is then increased slowly until tolerance is reached or the attacks are controlled.

Some doctors do no more than this even if the attacks are not controlled. The largest proportion of good results have been reported, however, from clinics in which the maximum

tolerated dose of each medicine used is rapidly reached; and if it is ineffective, another is gradually substituted for it. In stubborn cases, every available anticonvulsant is tried, in the largest dose the patient can tolerate; and if more than one seems promising, two or more are used in combination. The pattern of the brain waves, and the type of the attack, give the experienced physician some guidance in selection.

Good results may be obtained in this way, but a complete control of the seizures may be achieved only after months or years of trial and error. Recently, a special method of *rapid determination of optimum medication* or in medical slang, "drug study," has been employed to shorten the process and define the results. In this procedure, the patient is usually admitted to a hospital, and each day given a large dose of one of the anticonvulsant medicines in series. The doses employed are approximately ten to twelve capsules or tablets, or two to three times the ordinary daily dose. Three or four hours later, each day, a brain-wave test is run. When the series is completed (about two weeks) all of the records are compared, and it is usually clear that two or three of the available medicines are far more effective in regulating the brain waves than the rest. Usually two or three actually make matters worse. The test is carried out in a hospital because the patient may be sleepy, depressed or nauseated from the large

doses used, and may be grateful for the assistance available from a trained staff. He may also suffer seizures while taking the ineffective medicines.

Once the test is completed, it remains to select the best one or two medicines, and work out the maximum tolerated dose.

A disadvantage of the rapid method is the expense and disability it entails. This may be outweighed by the saving of time, especially in the case of a man or woman whose job is in danger, or a child disqualified from school because of seizures.

### *Medication in Cases of Isolated or Occasional Convulsions*

Should a patient be given anticonvulsant medicines daily if he has had only one or two attacks, or has them regularly but at intervals of many months? There is a diversity of opinion among doctors in regard to this problem, but my experience has convinced me that the wisest course is for the patient to take the maximum amount of medication he can tolerate, just as if he were subject to daily attacks. A convulsion a year can cost a man his job, his driver's license, even his life, if it provokes an accident. Taking a few pills or capsules a night is cheap insurance against such catastrophes, which I have seen occur in patients who became careless through overconfidence.

## Stubborn Cases May Require Drastic Treatment

*Some 500,000 epileptics have sufficient* luck to be kept seizure-free simply by taking medicines.

About as many more are not so fortunate, and may have to undertake the expense and risk of more drastic treatments. Some excellent results have been obtained in cases which seemed hopeless.

There are special hospitals in some states for the custodial care of those who cannot be maintained seizure-free, or who suffer from associated disabilities.

CHAPTER EIGHT

# Drastic Treatments of Epilepsy: Narcosis, Surgery, Ketogenic Diet, Special Hospitals

## *Introduction*

THE PATIENT whose seizures are controlled, or seem likely to be, by taking medicines regularly will be wise to skip this chapter, which deals in blood, sweat and tears. In over 50 per cent of cases, simple treatment with medicines prescribed from a doctor's office is effective, but the remaining 500,000 or so epileptics on this continent who are not seizure-free deserve consideration, too. Must they always be invalids, cut off from earning a living and the enjoyments of a normal life?

Medical science holds out some prospects for them also, but the way is not easy. The more stubborn and severe the disease, the more determination and power of endurance the patient

must display if he hopes for relief. These are in vain, however, if trained specialists and adequate facilities are lacking. But some measures have been found, and in some communities the hands and housing are available to put them into effect.

The drastic measures described in this chapter all have limitations. The intensive or narcosis treatment is expensive, and relatively few doctors have been trained to use it. In one fairly large clinic, it could be carried out in only about 12 per cent of all patients or about 25 per cent of those unrelieved by simpler methods. If it could be made less expensive it would probably be more widely applied. Surgical treatment is usually even more expensive, although for some reason impoverished patients can often find public hospitals ready to give costly surgical treatments, when costly medical treatments are unobtainable. But surgical treatment is applicable to a much smaller proportion of all cases—perhaps 2 to 5 per cent. The ketogenic diet (to be described later) might be tried with any patient, even in addition to a partially successful treatment with medicines, and it is not particularly costly. It is, however, extremely disagreeable and confining, and not often effective. The prospects of success with each form of treatment, and the dangers involved, will be discussed in this chapter.

Some patients must resign themselves to leading sheltered lives, often in a special hospital. This resource, too, demands some discussion.

### *The Intensive or Narcosis Treatment of Epilepsy*

It has long been known—for perhaps a century—that miscellaneous operations under general anesthesia might be followed by a cessation of seizures, even without the use of anticonvulsant medicines. Was this due to the anesthetic, or perhaps to the abstention from food and free use of sedatives after the operation? About thirty-five years ago, the observation was made that periods of starvation for one or two weeks were often followed by a decrease or disappearance of seizures.

Soon after the introduction of phenytoin (in 1937) several cases were reported in which patients took enormous doses—up to one hundred capsules a day, sometimes by accident, sometimes with suicidal intent. They all fell deeply asleep, but all recovered; and most of them then became seizure-free. This fact seemed to support the guess that anesthesia and sleep induced by certain drugs had a beneficial effect on seizures. The intensive or narcosis treatment was slowly evolved as a result of these observations, and began to be used systematically in 1947.

The method is somewhat as follows: the patient is placed in a hospital, and is provided with special nurses day and night. He is at once given a massive dose of phenytoin, or occasionally some other anticonvulsant—about forty capsules. Thereafter, for about four days, he is given enough more to keep him deeply asleep or so drowsy he can barely take fluids. He is fed sparingly or not at all during this period, so that he develops an acidosis, as with the ketogenic diet. His minimum needs for liquids are met by intravenous injections. Certain other apparently helpful measures are carried out, the details of which need not be considered here. After about four days, the anticonvulsant medicines are discontinued, and the patient is allowed to recover and return to his customary diet, which usually takes another week or more. The period of deep sleep is a trying and anxious one for the patient, his relatives, and the nurses and doctors, who sometimes have their hands full in meeting his needs.

Convalescence may be smooth, but is occasionally uncomfortable and tedious. The patient must ordinarily continue taking some medicine daily even after discharge from the hospital. In some instances, the patient never has another attack; in others, the attacks taper off over weeks or months. There are about 35 per cent of failures, and so far about 5 per cent of relapses after several years of freedom from

seizures. A second treatment is then often successful. In over half of the patients in whom this treatment has been applied, the seizures have apparently been due to scars of the brain, and they have done about as well as the others.

There are potential dangers in a treatment of this type, but so far no serious accidents have occurred when the requirements outlined above have been strictly followed. Clearly, such a form of treatment is a drastic and expensive one, but usually less expensive, less dangerous, and more widely applicable than surgical treatments. Some cases have been relieved by its use, after ineffective operations on the brain for the removal of scars, etc. It is likely that the converse may sometime occur, namely that a patient suffering from a scar may be relieved by surgical removal of it, after a failure of the intensive or narcosis treatment, but this has not as yet been reported.

### *Possibilities of Surgical Treatment*

"If only the cause of my attacks could be found and cut out, how happy I should be!" Perhaps every epileptic has said or thought this at one time or other, and the realities of the situation deserve study.

It was pointed out in Chapter 1 that convulsions are caused by the presence of tumors or scars of the brain in a small proportion of cases. If a growth can be demonstrated to be pressing

on the brain, an attempt should usually be made to remove it, for it threatens the patient's life as well as causing his symptoms. Possible exceptions to the rule are those desperate cases in which there appears no hope whatever of removing the growth successfully. The operation itself, to see what is there, is not a dangerous one in skilled and experienced hands. (Some suggestions in regard to choice of specialists will be found on page 141.) Attempts to remove the tumor, if it is found, involve a variable amount of risk, but seldom as much as leaving it alone, and dramatic relief has been obtained in many cases by successful operation.

The situation is not so clear when the presence of a scar is suspected, for if one focus of irritation has resulted from an injury to the brain, there are probably several. An obvious scar may not be the actual source of the convulsion. By narrow selection of cases—perhaps 5 per cent of those who present themselves for treatment—complete relief may be secured in 25 per cent or more of those operated upon, and partial relief in another 25 per cent.

On the other hand, exacerbation of symptoms has followed operations of this type in about 3 per cent of cases, and there has been about 2 per cent mortality in the best hands. In general, the best results are obtained in those clinics in which, after careful study, the small-

est proportion of patients are chosen for surgical treatment.

These statistics apply only to cases in which there are clear evidences of the presence of a tumor, abscess or scar. Unless there is clearly something abnormal present, surgery is seldom helpful. To be sure, it has already been pointed out that an operation of almost any kind—for example, appendectomy or hernia repair—may be followed by a period of relief of seizures, and this fact must be borne in mind in interpreting the statistics just given.

Another form of surgical treatment is sometimes employed successfully for the relief of an extremely serious, but fortunately rare symptom. In occasional cases, psychomotor attacks or behavior disorders become so violent as to be dangerous to the patient or those around him. If ordinary medical treatment has failed, the rages or furors may be brought under control by an operation on the frontal lobes. Usually a restricted, conservative operation of this type quiets down the excessive outbursts without impairing the patient's intellect, alertness or originality. The need for this type of operation has been reduced by the use of tranquilizing drugs and also by the advent of the narcosis treatment.

It will be clear from what has been said that needed operations are certainly not to be

*avoided in epileptic patients. Correction of depressions of the skull resulting from an accident,* and radical treatment of infected ears, are particularly worth considering in patients suffering from seizures.

The most puzzling situation is that in which, after adequate special tests, evidence of the presence of a tumor or scar is inconclusive. Should we then look and see, or wait and see? The question demands great experience and judgment on the part of the doctor, and self-control on the part of the patient. If medical treatment is meanwhile successful, it is often wisest to wait, but there are exceptions to the rule.

A word about operations on the brain in general may be in place here. A generation ago they were regarded with dread by physicians and laymen alike, and with reason, for the mortality was high. Today, they are a daily occurrence in many large hospitals, and the danger involved in opening the skull is scarcely greater than that involved in opening the abdominal cavity. The improvement has come about through a meticulous study of the details involved.

Many operations on the brain are carried out under local anesthesia. This can be done with little discomfort. The patient is made drowsy by means of a narcotic, and a local anesthetic is injected into the scalp, which can be ren-

dered entirely devoid of feeling. The skull and the brain itself are wholly insensitive. This method of operating has great advantages in some cases, for the surgeon can often plan his operation with greater exactness if he can observe the reactions of a cooperative patient. It also saves much postoperative discomfort, but in any case the convalescence from a cranial operation is usually free from the distressing pains, cramps, and general disturbance of bodily functions which are apt to follow serious abdominal operations.

*The Ketogenic Diet; Dehydration; Starvation*

About 1920, a systematic attempt began to be made to study the effect of starvation, and various diets, on the course of epilepsy. As a result, it became clear that acidosis (an acid condition of the system) had a beneficial effect on seizures. Acidosis is characterized by the appearance of certain substances ("acetone bodies") in the urine, a slight increase in the rate of respiration, and the presence of a peculiar sweetish, violet-like odor of acetone on the subject's breath. It was already known that this condition could be produced by starvation, by a diet high in fat, low in starches and sugars, or by reducing drastically the intake of fluids. All three measures are disagreeable, but sometimes effective. After about two weeks of fasting, a patient may find his seizures

## CHART 4

*Calculating Ketogenic Diet*

To be used in conjunction with some book on diets for diabetics. Diet must be made more rigid if it does not produce intense reaction for acetone in urine. (Use Acetest tablets.)

| | *Adult* | *Child* | |
|---|---|---|---|
| To determine protein requirement, multiply patient's weight in pounds by | 0.5 | 0.7 | Result shows weights of food components in grams |
| To estimate fat requirement, multiply patient's weight in pounds by | 1.6 | 2.5 | |
| To estimate carbohydrate (starch and sugar) requirement, multiply patient's weight in pounds by (first week) | 0.16 | 0.25 | |
| (thereafter) | 0.1 | 0.15 | |

*Sample diet for adult of 120 lbs*

Breakfast:

| | | |
|---|---|---|
| Fruit, 10% | 30 | grams |
| Bacon, rare | 20 | grams |
| Eggs | 2 | |
| Cream, 40% | 20 | grams |
| Butter | 20 | grams |
| Muffin (soya-bran) | 1 | only |
| Coffee with saccharine, if desired | | |

Noon:

| | | |
|---|---|---|
| Vegetable, 3% | 100 | grams |
| Meat with fat | 90 | grams |
| Muffin (soya-bran) | 1 | |
| Butter | 20 | grams |
| Cream, 40% | 100 | grams |
| Mayonnaise (no sugar) | 20 | grams |
| Tea or coffee (no sugar) | | |

Night:

| | | |
|---|---|---|
| Cream, 40% (for soup) | 50 | grams |
| Vegetable, 3% (half in soup, half in salad) | 100 | grams |
| Mayonnaise | 15 | grams |
| Meat or fish, lean | 80 | grams |
| Muffin (soya-bran) | 1 | |
| Butter | 20 | grams |

CHART—*Continued*

| | |
|---|---|
| Cream, 40% (for fruit) | 50 grams |
| Fruit, 5% | 50 grams |
| Tea or coffee (no sugar) | |

Increase fat, decrease carbohydrate but not protein if profound acidosis is not produced. Give vitamin supplements as directed by physician.

—especially *petit mal*—greatly decreased for months or even permanently, without further change of diet. Reduction of fluid intake to about one pint daily is usually enough to produce an acidosis as described above, and has a similar effect.

The use of the high-fat ketogenic diet largely replaced both of these measures, and has been in turn largely replaced by the introduction of the specific anticonvulsant medicines. The diet is occasionally still useful, however, if other measures prove ineffective. It may also be combined with them.

It has serious disadvantages. Adults can seldom bring themselves to stick to it, and children tend to grow rebellious, tearful and emotionally warped if they are forced to submit to it.

Half-measures are useless; the diet must be pushed to a point where demonstrable acidosis occurs day and night. There is danger of a vitamin deficiency, and supplements must be given, often by injection.

The diet must be computed for each individ-

ual, in general on the basis of the formulas given in Chart 4. Usually this requires the help of a dietician or doctor. Suitable recipes may be found in cookbooks dealing with the diet of diabetics, and special low-carbohydrate foods may be purchased at many grocery stores and special shops. The presence of acetone in the urine may be determined by the use of "Acetest" tablets, available with instructions at drugstores.

Might the advantages of acidosis be obtained by adding something to the diet, rather than leaving so much out? This fascinating possibility has led to a study of various acid-producing substances, some of which appear promising. None are widely used as yet, however. More will be said about them in Chapter 11.

### *About Institutions*

There are periods in the course of many cases when retirement to a well-run special resort or farm would be most helpful—especially during the stage of adjustment to a regimen. Proper places are difficult to find, however. A list of them—doubtless still incomplete—is on file with National Epilepsy League and the National Society for the Brain Injured (*see* page 180). They should be more numerous and varied. In a few (nine) states, there are well-managed farms or colonies maintained at public expense for "epileptics" who are incapacitated,

which is a reasonable solution for a part of the problem. In most of these institutions a determined effort is made to teach the patient to avoid attacks, so that he may return to his place in the outside world.

In other states, epileptics who are incapacitated and a public charge usually have to go to some state hospital for the mentally ill. This is seldom satisfactory. Special facilities should be provided; now is the time to put pressure on your state legislators to see that something gets done.

## Some Common-Sense Rules for Helping to Bring the "Dam" and the "Watershed" Back to a Normal Situation

Keep in touch with a competent physician.

Take the medicines prescribed with absolute regularity.

Take plenty of exercise. Develop your muscles. Improve your posture.

Avoid irregular hours and unusual fatigue.

Keep an attitude of hope and courage and use the means at hand for preventing difficulties.

Get a job if you can, or find some interesting hobby or form of creative work.

Respect your own warning signals.

Remember that there are many prominent people in similar situations, and that friends can always be found who are willing to help.

CHAPTER NINE

# Miscellaneous Problems in Connection with Treatment

## *The Importance of Exercise*

AN OLD RULE for recovery from convulsions is to lead a vigorous outdoor life, and it is still an excellent one. Most patients need only try it thoroughly to become convinced. When it is feasible for the patient to do so, it is an excellent plan—if contact with an experienced doctor can be maintained meanwhile—for him to spend approximately the first six months of treatment in the country, doing farm work, walking, rowing, or swimming, while the dosage of medicine is being adjusted. If the attacks do not yield to treatment, country life may be advisable for an indefinite period.*

Usually such a drastic change is not possible. In cases of moderate severity, much can be accomplished even in a city by means of gymnasium work, badminton, walking, carpentry, etc., and a definite effort is well worth while. One

* Hippocrates, the great physician of ancient Greece, writing in the fifth century B.C., remarked, "Epilepsy in young persons is most frequently removed by changes of air, of country, and of modes of life."

of the most serious deficiencies in our present medical facilities is the lack of opportunities for exactly such treatment, in the city or out of it. Obviously there are some limitations to the type of exercise permissible, which will occur to anyone who gives the matter a little thought. They vary slightly from case to case, and will be discussed below.

While exercise is desirable in the great majority of cases, certain types of exertion seem to provoke attacks in occasional patients. Sudden vigorous efforts seem to be undesirable in cases of brain injury, and certain types of disease of the blood vessels of the brain. Exercise which causes the patient to pant and be short of breath may precipitate seizures in certain instances. So may playing a wind instrument, loud singing or shouting, and the like. There is need for alert observation and common sense in every case, but a regimen of athletic "training" is practically always worth trying.

An example of the benefits sometimes derived from vigorous exercise is seen in the case of a man (Case 10) who, in spite of monthly attacks, worked his way to being the superintendent of the shipping department of a small factory. After these attacks had continued for some years they were stopped by a change in medicines. A year later he came to his doctor saying he was now completely cured. The doctor, who had felt pleased with his success for some months, asked for an explanation.

"When I first came to you," the patient said, "I was in a fog. When your pills stopped the attacks, the fog became a mist. Since I have given up my work at the desk and have joined the boys who load the trucks, the mist has lifted, and I feel as well as ever in my life."

### *Work and Play*

Get a job (or hold your present one) if you possibly can, even though your attacks are not completely under control. Sometimes it is better to discuss the problem candidly with your employer, sometimes wiser to make every effort to effect complete control, perhaps taking a holiday meanwhile, and saying as little as possible about the matter. This difficult decision should be discussed with your physician. In general, people have fewer seizures if they are working, active and interested.

If it is impossible to hold or secure a regular job, try to find some interesting study, hobby or employment. The desirability of having some form of personally creative work cannot be overestimated. It has been the experience of millions of people that they can lose themselves to such an extent in activities which are particularly interesting to them, that minor and even major difficulties may be robbed of their power to produce unhappiness. The worst thing to do under any circumstances is to sit around waiting for the next attack to occur.

Creative hobbies are not only of inestimable

value in helping meet situations where control of seizures is not complete, but are also a means of creating the state of mind and body which is helpful in actually preventing seizures.

### *About Diet and Liquids*

If attacks are controlled by medicines and exercise, most physicians are not concerned about diet beyond the dictates of ordinary common sense. Regularity of meals (and also of hours of sleep) seems to be of some importance in some cases. If certain foods or eating habits appear to precipitate attacks, the remedy is obvious. Strict moderation in alcoholic drinks should be observed. Nothing stronger than wine or beer, and never more than a glass at a meal, should ever be taken; some doctors disapprove even of this. This is not a dictate of puritanism, but a rule learned from wide experience. Some patients seem to be made worse by taking coffee or tea. It may be worth while to try doing without them for a few weeks.

In the preceding chapter, the ketogenic diet was described. This is the only one which is generally accepted as being sometimes helpful in the treatment of seizures. It is seldom used nowadays, since the use of specific medicines is usually successful, and much pleasanter and less expensive. Again, the fact should be emphasized that this diet should be applied thor-

oughly or not at all. Halfway measures are useless, wasteful and annoying.

Constipation should be strictly avoided. The diet should include enough bulk to produce a movement daily. Oil, agar, or some combination of them (preferably without phenolphthalein which tends to be irritating) is sometimes prescribed in addition. Salts or an enema should be employed on days when a spontaneous evacuation does not occur. Colonic irrigations have no special virtue. These general directions may have to be modified by the physician in charge.

### *Psychologic Treatment*

There can be no doubt that in certain instances seizures are precipitated by emotional disturbances. This is particularly true of attacks of the psychomotor type. The emotional disturbances may in turn be due to the ordinary annoyances of life or to extraordinary personal problems. Everyday vexations may be disagreeable enough in themselves, but when they lead to incapacitating symptoms it is well to look around to see if something can be done about them. One way of altering the situation is to alter the patient's surroundings. If contact with certain persons is regularly disturbing, he may be able to avoid them. Some places are apt to be less disturbing than others, and perhaps one of the benefits of a few months in the country, as recommended on page 131, is the relaxing effect of quiet and change of scene.

If a change in external circumstances is impossible or insufficient, the physician in charge may feel it wise to recommend treatment by a psychiatrist. It is often helpful to talk over one's problems with a sympathetic person endowed with common sense, but even better to discuss them with a qualified specialist who has had proper training and experience as well as possessing these assets. Sometimes a relatively few interviews are sufficient to bring about a comfortable adjustment. In other instances, daily sessions over many months are required —in short, a formal psychoanalysis.

An example of what can sometimes be accomplished by psychologic means is seen in the case of a twenty-five-year-old girl, who began to have *petit mal* in early childhood, as reported by her psychiatrist (Case 11). "With the onset of menstruation she began to have *grand mal;* each attack occurred at about the beginning or end of the menstruation, and the attacks were quite frequent. She had a complex and tense home situation and craved affection. Although her only convulsive episodes appeared at the time of menstruation, they usually occurred when she had been under some emotional stress and there were frequent minor 'lapses.' Her *grand* and *petit mal* increased in frequency. She was interested in nothing but herself, and was consumed with bitterness and self-pity. She was sent away from home to live in an apartment with a young, psychiatrically-

trained nurse of her own age who works in close harmony with the psychiatrist. She was given opportunities to do volunteer social work at which she has been successful. For the first time in her life she has a sense of being worth while. Under moderate dilantin and phenobarbital medication she has remained free of seizures for six months, and her *petit mal* rarely appears."

As has been pointed out on page 46, a susceptibility to seizures, like any long-lasting handicap, may produce disturbing emotional problems. In some cases, the latter may need prolonged psychologic treatment, or even psychoanalysis. Naturally, this should be discussed with the physician in charge.

Of great, sometimes determining, importance in the course of a case is the attitude of the family toward the patient. This is most striking when seizures begin in childhood. The parents may take either of two attitudes, or both; they may be oversolicitous and overprotective, or they may be resentful of the illness, attempt to hide it, and punish the patient in subtle ways for it. At the one extreme, the afflicted child may receive an undue share of love and attention, be relieved of every duty in the home and at school, and may in the long run be transformed into a spoiled invalid incapable of taking his place in life even if the seizures are controlled, unless at the expense of a determined struggle. At the other extreme,

the existence of seizures may be felt to be a disgrace to the family, and the patient may find himself regarded as unworthy of educational and social advantages. Human nature is renowned for its inconsistencies, and these two attitudes are often found alternating or co-existing, as if one were an overcompensation for the other.

Surely these mistakes need only be pointed out to be recognized. It is far kinder to the patient, even if he is young and helpless, to insist that he carry the responsibility of taking his medicine, and avoiding the disabilities of his disorder. While nothing—not even education—should stand in the way of rigorous treatment, the rest of his life should be as normal as possible. Temper tantrums may be the expression of psychomotor attacks. If so—or in any case—they should not lead to punishment, but neither should they cause the patient to gain ascendancy over the rest of the family. It is to be hoped that enough has been said elsewhere in this book to make it clear that there need be no sense of disgrace attached to a tendency to convulsions, any more than to a tendency to hay fever.

The aim of the family should be constantly to help the patient to a realistic view of his disability, which will minimize or abolish the handicap that it involves. It is a real problem, sometimes a serious one, but it must be faced squarely and dealt with directly, in a matter-

of-fact manner. When this challenge is met, the patient is in the best possible position to overcome his attacks and attain his normal place in society.

### *General Precautions to Be Taken by Those Suffering from Seizures*

Common sense suggests at once that a person subject to attacks should avoid certain situations which might prove dangerous or embarrassing.

The first of these is driving an automobile, when even a momentary lapse of consciousness may mean disaster. In some states, "epilepsy" is a reportable disease, and its presence automatically bars the afflicted person from obtaining a license—probably too rigid a rule, which has doubtless led to a decrease in the apparent incidence of "epilepsy" (*see* page 155). As long as a definite danger of attacks exists, driving should certainly be forbidden. In mild cases, if the patient shows that he can faithfully follow a routine and be completely relieved by it, the prohibition may be lifted after, say, two or three years of freedom from attacks. This is the rule which has been adopted by most states. In my own experience, the cooperation of the licensing authorities is best ensured by keeping them informed of the progress of the case by the doctor in charge, whose advice is then likely to be followed. Evidence that the patient

takes his medicines absolutely regularly and is regardful of his responsibilities in general, usually weighs in his favor. A report of a brain-wave test should usually be submitted to the authorities with the doctor's recommendation that the patient is ready to apply for a license. More will be said about this in the next chapter.

The second common situation is swimming alone. If anyone, even a stranger, is about, the danger usually becomes so small that it can be ignored.

The third, less common, is proximity to heavy machinery. Factory workers, sailors, stationary engineers, trainmen, and so on, may have to change their respective occupations, or give them up during a period of probation.

The situations which are merely embarrassing are so numerous and varied that they are beyond generalization. A typical one is the problem of a child at school. Often a single attack in class, or the diagnosis of "epilepsy," is enough to prevent further attendance. If the problem can be attacked before a judgment has been passed, it is often wisest at once to take the child out of school for a term, and to give him intensive treatment. In Utopia, there would be special institutions for observation and treatment, and special schools for children with convulsions. Needless to say, each individual problem requires special consideration, and a nice balance between courage and caution. The advice of an experienced and resourceful

physician is invaluable in formulating a policy in regard to each of these problems.

Military regulations have in the past expressly forbidden the induction of anyone who has suffered from a seizure (in adult life) into any of the armed services. Recently, some new rulings have been made, and the exact draft status of patients whose seizures are under control is obscure at this writing. The question is specifically asked in the registration blank, and it must be accurately answered under penalty for perjury. Usually some further evidence is required beyond the candidate's own statement —a letter from a physician, or the testimony of witnesses. Service in the Army or Navy appears to be particularly apt to bring out a latent tendency to seizures. Induction of a man suffering from them is a grave mistake for him and for the nation.

### *On the Choice of a Physician*

Ordinarily, the doctor who knows the patient best is best able to advise him in regard to treatment. The available methods of combating a tendency to recurrent convulsions are not difficult in principle, and are well described in current medical journals (though not as yet in most textbooks, which lag on an average about ten years behind the most advanced practice). Surgical treatment is, of course, a special problem, requiring the judgment and skill of an expert.

There are physicians, however, who for one reason or another do not wish to treat cases of epilepsy, and prefer to refer their patients to specialists. Problems may appear in the course of any case which make consultation with a specialist advisable. There will probably always be some cases in which the general practitioner is unable to render the patient seizure-free and in which a specialist may be helpful. Every patient should discuss the matter with his own doctor should the question arise. If by any chance he does not have one, he can obtain lists of competent physicians from his local medical society, or from a neighboring medical school.

In general, specialists classified as neurologists have had a type of training which makes them expert in the diagnosis of the cause of seizures. They are also usually experienced in the management of difficult cases. Many psychiatrists also treat convulsive disorders. Lists of competent specialists may be found in the *Directory of Medical Specialists* (available at all medical libraries and many public libraries). Membership in the American Neurological Association, the Academy of Neurology or the American Psychiatric Association, or a position on the faculty of a well-known medical school, is the mark of distinction. Membership in the American branch of the International League Against Epilepsy is an indication of a special interest in the subject. Lists of members may

be obtained from the Secretary of the National Epilepsy League (*see* page 180), and these are of course particularly interested and expert in the problem. Information concerning any physician's age, training, specialty, society membership, and other qualifications may be found in the directory of the American Medical Association (available at most public libraries).

If an operation is under consideration, especial care should be given to the selection of a neurologic surgeon. Exceptional training, intelligence, and devotion are required for success in this difficult field, and only a limited number of qualified experts are available. The directory of specialists will be found valuable. There are two national societies in the United States; the Harvey Cushing Society, and the Society of Neurological Surgeons. The latter is smaller, and comprises chiefly the older men in the field.

In selecting a specialist, it is quite as essential that he should be one with whom the patient's physician can work as that he should possess generally recognized qualifications. The relationship between a family physician and a consultant is governed by a strict code of ethics, which has grown spontaneously out of the necessities of the situation. It is perfectly proper for either the doctor or the patient to suggest a consultation with a specialist, especially if there are difficulties in diagnosis and treatment. Under these circumstances it is the

province of the specialist to review the case and to make recommendations to the doctor in regard to treatment. If further problems arise, he usually remains in the background as a source of expert advice to the doctor in charge. Specialists sometimes prefer not to supervise treatment directly and in detail. That is usually the province of the patient's own physician, unless he definitely wishes to delegate it.

Of course, this does not mean that any patient is bound to stay with the first doctor he encounters. If he makes a change, however, he should notify both physicians involved. It is particularly important to preserve a cordial relationship and cooperation among the various physicians who are in contact with a case, as one may have some information which might be invaluable to the others.

*Proprietary and "Patent" Medicines; Charlatans*

During the period when the treatment of "epilepsy" was in a state of flux, ineffective, neglected by the medical profession, many proprietary medicines were sold in drugstores or by mail to patients who were gullible or desperate. With a few exceptions these medicines consisted principally of phenobarbital and bromides, in doses which physicians would hesitate to use. Occasionally it would happen that an individual doctor, prejudiced against the use of anticonvulsants, would "give up a case as hopeless," and the patient would then

seek relief in a proprietary cure. Now, happily doctors are better trained, and laws regulating the sale of drugs are stricter.

It should be emphasized that proprietary remedies are always more expensive than standard ones, even calculating a reasonable physician's fee with the latter. Further, all of the effective remedies for convulsions have been discovered by doctors working patiently with recognized scientific methods. The change that some inventor in a garret will discover a miraculous "cure for epilepsy" unknown to the medical schools is about as great as that an amateur mechanic will manufacture a line of automobiles to supersede all those now on the market. We fortunately now possess technical methods of predicting in general what measures will tend to control convulsions, and of putting them to a rigid comparative test in special laboratories and clinics, so that there is little room for guesswork about them.

Federal laws require that "patent" and proprietary medicines should bear labels showing what is in them. It is a good idea to read such labels, and discuss them with a doctor. "Adjustments" of the spine, manipulations, light-baths, colonic irrigations and various charms are occasionally reported to have cured epilepsy, usually by those who have such treatments for sale. There is a small chance of stopping hysterical attacks by such procedures; of stopping real convulsions, none.

## What Is The Outlook?

*The outlook should always be one of hope.*

An attitude of hope and courage helps to lessen liability to seizures.

Actually, the outlook is far more encouraging than most people realize. Three patients out of four are relieved and more are helped by modern treatment.

Although problems may be difficult, there are reasonable answers to most of them.

Best results are obtained by persistent efforts to find improved treatments until control is obtained.

Many men and women have lived full and happy lives, and have even achieved greatness, in spite of seizures.

CHAPTER TEN

# The Outlook for the Individual

## *How Can the Future Be Predicted?*

PROPHECY is notoriously untrustworthy, yet we have no choice but to attempt it. It is most successful when it rests upon wide experience in the past, and is applied statistically to a large group in the future. Applied to an individual, it must be founded in part on what has happened to others, in part on the events in that individual's life. Specifically, in dealing with a problem like that of seizures, prediction beyond a consideration of statistics is scarcely worth attempting before a thorough medical study has been made of the situation (as outlined in Chapter 3), and a systematic regimen of treatment has been instituted. The rough figures available show that there are several large series of cases on record in which adequate treatment early in the course of the disease has arrested the attacks in 60 to 80 per cent of those observed. Seizures sometimes cease spontaneously after a few years even without

treatment, and it is likely that medication can eventually be dispensed with by some patients who are now taking it. More precise information is at present lacking, but we are still learning rapidly.

### *The Outlook if Attacks Are Relieved by Treatment*

If attacks are entirely stopped by medical treatment or reduced to a point at which they are not incapacitating, the best policy is to settle down to the effective regimen with the determination to continue with it indefinitely. This individual patient may be just the one who can now do without his treatment, but the only way to be sure is to try and see. And a sorry mess it is if the experiment is a failure. Aside from the temporary embarrassment, he may lose his driver's license, his job, even conceivably his life, from running undue risks. On the whole, therefore, the trouble and expense of taking a few pills and observing a few precautions is cheap insurance.

If ever a decrease in dosage is to be considered, it should be thoroughly discussed with the physician in charge. To minimize the risk, if for some reason it must be taken, the dose may be decreased by one tablet every year, preferably during a vacation when a seizure would be least catastrophic. On the whole, even this is not a very good idea.

Perhaps some time in the future we may develop a laboratory method of determining when an individual can safely do without his medicines. We do not have it now. Certainly any patient whose brain waves are still abnormal or unstable is courting disaster in decreasing his medication.

In a small proportion of cases, a level of dosage which is adequate at first gradually loses its effectiveness, and has to be increased. It is, however, seldom impossible to find some medication or routine which will prevent attacks, if they have once been successfully treated over a period of months. The confidence which patient and doctor feel in the durability of a successful treatment naturally increases as time goes on. As has already been remarked, a period of probation, away from work or surroundings in which a seizure might be embarrassing, is often advisable. How long it should be, and where it should be spent, are problems for judgment in the individual case. It is often wise also to make a gradual return to activity.

As a rule of thumb, two years of successful treatment is often taken as the minimum which can be considered as evidence of a symptomatic "cure." By this time, the patient is usually well practiced in his routine, and can trust himself to follow it. The question of relaxing some of the more drastic precautions—for example, the prohibition against driving an automobile—

may then be considered, always in consultation with a physician.

In some states, the law forbids the issuance of a driver's license to anyone in whom the diagnosis of "epilepsy" has been made. The precaution is one which is thoroughly justified in principle, but which works hardship in individual instances. On the whole, it is far wiser for the patient to take more precautions than the state demands. He should abstain from driving from the time of the first attack of a type which might conceivably endanger others, and should not apply for a license again until his physician feels justified in signing a statement that his attacks are safely under control. The State Board of Health of California utilizes the following legal definition of epilepsy: "Any condition which brings about momentary lapses of consciousness and which may become chronic shall be considered reportable under the term epilepsy." There is a similar provision in Oregon, and it is implied in the laws and rulings of other states. In many, the problem is left to the discretion of the physician. For a more complete account of the tangled, often contradictory laws governing the issuance of a driver's license to patients whose seizures are controlled, the reader is referred to the book *Epilepsy and the Law,* by R. L. Barrow and H. D. Fabing, Paul B. Hoeber, Inc., New York, 1956.

### *The Outlook if Treatment Is Not Effective*

In the present state of our knowledge, treatment is still to some extent a matter of trial and error. If the standard forms of treatment outlined in the last chapter are not immediately successful, the period of probation must often be prolonged until all of the available medicines, or at least representatives of all types, have been tried; in some cases, one or more of the drastic treatments also.

We must face the fact that there are instances in which no treatment at present available is successful. Under these circumstances, patient and doctor have no recourse but to consider carefully the assets and liabilities of the situation, and to plan to make the best compromise possible—usually a life of semi-invalidism or retirement. Planning ahead is usually somewhat simplified by the fact that the type or types of attacks tend to recur in similar form in a given case, and a close study will often permit the patient or physician to predict and prepare for them. The battle is not necessarily permanently lost. The recent past has seen some dramatic improvements in treatment, and the near future may reveal some even more revolutionary. More will be said about this in the next chapter.

And if no effective treatment is ever found? Only the weak will give up hope. There have

been many people subject to convulsions who have led long, contented, useful lives.

Some have even achieved greatness. Mention has already been made of Julius Caesar and Napoleon Bonaparte (pages 16 and 17). Mohammed, the founder of a great and (for its time) liberal religion, suffered from frequent *grand mal* seizures, during which he received some of his revelations. Hector Berlioz, a great composer of the middle of the last century, had occasional attacks. Gustave Flaubert, renowned French novelist, had frequent seizures. So did Feodor Dostoyevsky. Van Gogh, the Dutch painter whose pictures seem quivering with life, was subject to psychomotor attacks. The list could be extended much further.

In our own day, I have personally known of a prominent professor of surgery, who is able to continue operating and teaching now that his attacks are controlled; a gifted writer-producer, whose works are familiar to everyone who watches television; a renowned major general; and many whose names and faces are less familiar, who have lived full lives and contributed to our civilization, despite having epilepsy.

### *Is There Danger of Insanity?*

An account has already been given in Chapter 2 of the common forms of impairment of

emotional and intellectual life which may be entailed by the tendency to convulsions. There is only one of them which is past hope of treatment, a relatively rare condition; namely, actual destruction of brain tissue by a disease process which also produces convulsions.

Can any of these disabilities be termed "insanity"? The term "insane" is legal, rather than medical, and means essentially that the patient is such a menace to himself or to society that he cannot be allowed at large. A considerable number (but small proportion) of patients suffering from convulsions are found in hospitals for the "insane," merely because they have no other place to live. Only a tiny fraction of them have to be restrained on account of the possibility that they might commit crimes. This constitutes a distinct form of the disease, and there is no likelihood that it will develop from the commoner forms, for (as has been remarked above) each patient has his own pattern or habit of attack from which he rarely deviates.

There is another aspect of the problem, which need be considered only briefly in this chapter. In all large mental hospitals, there is a large proportion of patients committed as legally "insane" because of various disorders of conduct, whose brain waves show dysrhythmic changes suggestive of epilepsy. Case 4 (page 18) is an example. More will be said about this special problem in Chapter 11.

## *Should Persons Subject to Convulsions Marry? Legal Aspects of the Question*

In many states, the marriage of "epileptics" is forbidden by law. Such statutes exist in the following states: Delaware, Indiana, Michigan, Minnesota, Missouri, Nebraska, New Hampshire, North Carolina, North Dakota, Ohio, Oregon, Utah, Virginia, Washington, and West Virginia. It appears, however, that such laws are practically never enforced. At least, the author has not been able to find records of any convictions under them. Only rarely has the presence of "epilepsy" in one partner been found adequate grounds for annulment of marriage, and then only because of fraudulent concealment or complete incapacity.

### There Is a Legal Problem, Too

Many of the laws at present on the statute books are founded on antiquated conceptions, useless and unworkable.

Their interpretation should be clarified and systematized, and a persistent attempt should be made to improve them.

Pertinent decisions should be collected and made easily available to the legal and medical public.

It has already been pointed out (page 20) that the term "epilepsy" has a legal as well as a medical significance, and that the two do not necessarily coincide. There is, indeed, a tendency to drop the term "epilepsy" entirely as a medical diagnosis. In relation to marriage (and other legal problems) the legal definition is in considerable doubt. The legal definition used in California, where "epilepsy" is a reportable disease, has been given on page 150. In other states, no definition is given, or medical certificate required, before a marriage certificate is issued. A typical clause is that in the North Carolina statute, which provides that the certificate must show that "by the usual methods of examination . . . the applicant was found to be not subject to epileptic attacks."

Clearly, the term "epilepsy" in the legal sense need not be applied to anyone whose seizures are controlled by treatment. Further, it would seem a reasonable legal assumption that if the diagnosis "epilepsy" is to be used to deprive a citizen of his ordinary rights, it must be established by action of a court, just as no one is legally "insane" unless so adjudged. In the absence of such court action, he is free to do as he wishes. In cases of real doubt, for example when either party suffers from uncontrolled seizures, a competent lawyer should be consulted.

Since most of the restrictive laws dealing

with marriage, or making sterilization mandatory, are practically never invoked, they should be modified or deleted. The two-hundred-year-old law in Sweden forbidding the marriage of epileptics has recently been repealed. Those who are in a position to influence legislation on this subject should read the interesting book *Epilepsy and the Law*, by Barrow and Fabing (*see* page 150).

### *Medical, Social, and Economic Aspects of the Question*

Regardless of its legal aspects, the problem of marriage may be considered separately from the problem of having children, except for the adherents of certain religious faiths, and for those who have ethical objections to contraceptive measures.

It is rare to find that sexual indulgence tends to increase tendency to attacks. Childbearing appears to have no especial effect on a tendency to seizures, and a pregnant woman may take the ordinary anticonvulsant medicines without fear of effect on the baby. Even a deliberately childless marriage may, however, be extremely unwise for patients whose earning capacity is impaired or destroyed by their disease, and who have no other income. If the attacks are not controlled by treatment, married life (not always easy for healthy couples) may be made extremely difficult by them, especially by

psychomotor episodes. I have known girls who felt that some physical handicap would arouse a husband's protective instincts; but from what I have observed, I cannot advise anyone to count on it.

It may be easy for the well partner to consent to be childless (if this seems wise) at the outset, but it may become more difficult as time goes on. If the decision not to have children is definitely made, the patient subject to attacks should be made sterile by surgical means, as it is unsafe to trust to ordinary contraceptive measures under the circumstances. This brings up at once the legal problem of eugenic sterilization.

### *Sterilization and "Epilepsy"*

In most states (Massachusetts constituting one exception) any person may legally have himself or herself rendered incapable of procreation by means of a surgical operation, and this right is widely sought by those suffering from hereditary diseases. In certain states, duly constituted authorities may at their discretion compel the eugenic sterilization of those suffering from specified conditions of which one is "epilepsy" (in the legal sense). These states include the following: Arizona, Delaware, Idaho, Indiana, Kansas, Michigan, Mississippi, Montana, New Hampshire, Oklahoma, Oregon,

South Carolina, Utah, Virginia, and West Virginia.

As a matter of experience, these laws are rarely put into effect, and then in only the severest cases upon release from an institution. The mandatory provision of the statute appears to nullify whatever virtue such a law may have. Legislation permitting certain authorities in state institutions to recommend sterilization in selected cases, as in Maine, Minnesota and Vermont, doubtless serves a useful eugenic purpose. The legality of such sterilization laws has been successfully contested in several instances. In this connection also, the question of what constitutes "epilepsy" for legal purposes remains unsettled and the rule that a person is "epileptic" in the eyes of the law only if so adjudicated by court action would seem to apply (*see* page 155). If any problem arises in this connection, the patient should read the book *Epilepsy and the Law* (*see* page 150) and in addition, seek the advice of a good attorney. (*see also* Chapter 11)

### *Should Those Subject to Seizures Have Children?*

Persons suffering from attacks who are not subject to eugenic sterilization, either because they are not "epileptics" under the legal definition or because they live outside of the territory covered by such laws as those just re-

viewed, may be faced with the problem whether or not to have children. It is a difficult one, affecting, as it does, the family and society as well as the individual. Supporting and educating children seems to grow more expensive year by year, and the economic problems of marriage are multiplied many times when babies are born. In addition, there is reason to believe that some tendency to seizures may be hereditary, even in cases in which they have appeared only subsequently to an injury or wound of the brain.

There are three sets of circumstances, any of which may be considered definite grounds for advising a given person not to have children. The first is the existence of a high degree of disability resulting from his disorder. The second is a history of convulsions occurring in two or more successive generations of his (or her) ancestors. The third is evidence that there is some tendency to seizures in the family of the other prospective partner. Under any of these circumstances, the likelihood that the children will be subject to seizures has been shown to be extremely serious.

A tendency to have convulsions can now often be disclosed by means of electro-encephalography. It would be an excellent idea always to carry out this procedure in both parties when the problem of marriage comes up in regard to a person subject to seizures. The problem becomes more debatable when it relates to a per-

son suffering from "idiopathic epilepsy," who knows of no blood relatives with the same disorder. Unquestionably the children of such a person would run a greater risk of suffering from convulsions than the average. How much greater, it is at present impossible to predict in a given case. We do have some guidance from statistics, however, which show that about one person out of two hundred of the population at large is subject to seizures. The incidence of a tendency to convulsions among the relatives (and presumably, therefore, among the children) of patients who have attacks, is about one in forty. These statistics are perhaps somewhat deceptive in that they include the offspring of families in which the tendency is marked, or occurs on both sides. It seems fair, however, to say that the children of a parent suffering from "idiopathic" seizures are about five times as likely to have attacks as are the children of normal parents.

A person who has developed convulsions after a head injury or as a result of a tumor, and is relieved of them for two years or more by a surgical operation and without the use of anticonvulsant medicines, is probably entitled to consider that his threshold for seizures is not far from normal. He has then no reason to abstain from marriage. The situation is less certain if he has blood relatives who have "epilepsy," or if he himself continues to have attacks.

The statistical probability that a child of his will have them then becomes about one *in sixty.*

It should be emphasized again that decision in such difficult and fateful problems should be arrived at only after a careful consideration of the individual circumstances, including the economic position of the prospective pair, the family histories, laboratory tests, and the effect of treatment. The outlook should be discussed with complete candor by both parties involved, in consultation with an experienced physician. It is always wise to leave a considerable period—six months at the least, more in early cases—for all concerned to think the matter over, and to watch the progress of symptoms and treatment. Eventually, of course, the decision rests upon the prospective partners, except in the rare instance that one of the old laws has been invoked.

The point of view which has just been presented, in regard to the marriage of those subject to convulsions, differs considerably from the accepted medical doctrine of a generation ago, which was that "epileptics" should never marry. It is quite possible that further advances in knowledge will alter the situation still more. If, for example, there should be improvement in our methods of determining the degree of constitutional susceptibility to attacks, in those suffering from them, and in unaffected individuals, the problem would become much

clearer. A change of sentiment might easily take place also if methods of treatment become more effective. An interesting parallel is furnished by the history of diabetes, in which heredity is more definitely a factor than in the tendency to seizures. Marriage was formerly considered out of the question for diabetics. Now that an effective treatment is available, the economic hazard has become one which can be estimated, and the possibility of having a child who may develop diabetes no longer seems calamitous.

### *Life and Health Insurance*

Some people who suffer from seizures have difficulty in securing life insurance, or obtain it only by failing to mention the existence of their attacks—a questionable expedient, as it might subject the contract to cancellation on the ground of fraudulent concealment. The policy of life insurance companies is not well defined and apparently no actuarial data evaluating the risks involved have ever been compiled. Some companies will, however, write insurance for those who have been many years (usually ten or more) without seizures, and at substandard rates for certain others. A few insurance companies have gone farther, and are making a special effort to adjust their rates to the risks involved. The names of these companies can be secured from the National Epilepsy League. (*see* page 180) Some large businesses provide

group life insurance for their employees; if this is obtainable, there is, of course, no problem.

A mutual association seems to be the only general solution for the problem of individual health insurance, which is ordinarily unobtainable by anyone suffering from any chronic disorder. If the person in question, or the wage-earner of his family, is employed by an organization which subscribes to one of the comprehensive health insurance plans, there is ordinarily no difficulty in obtaining its benefits if the application is made promptly by the wage-earner on securing employment. Such insurance plans include Group Health, Inc., and the projected Health Insurance Plan of New York; Group Health in Washington, D.C., Blue Cross, Blue Shield, the State Physicians' plans where available, and the like.

The question of employers' liability insurance is considered below.

### *Legal Liability of "Epileptics"; Legal Aspects of Employment of "Epileptics"*

No general rule can be laid down concerning liability for damage done to the person or property of others during an attack. The existence of a psychic equivalent seizure has apparently seldom been used as a legal defense, perhaps evidence that misdemeanors rarely occur during attacks. The fact that a person suffers from convulsions does not incapacitate him for making

contracts, or making a will, or in general, relieve him of the responsibility for his actions.

Suits for damages on account of injuries sustained during convulsions are sometimes brought against employers under workmen's compensation laws. They have sometimes been decided for the plaintiff, sometimes for the defendant, depending upon the circumstances of the situation. The employer has not been found liable for injury incurred during an attack in a situation involving no special hazard; for example, a sidewalk. In general, the problem is the employee's, not the employer's. Anyone whose seizures are not fully controlled by treatment must bear the responsibility of finding work which does not carry a special danger for him, for his own sake. If the employer is insured, the burden of any damage for which he is legally liable falls on the insurance company in most states, irrespective of pre-existing illness or disability on the part of the employee. The insurance company insures employees in large groups without inquiring into the health of individuals.

The Association of Casualty and Surety Companies, representing sixty-one capital-stock insurance companies, has issued a statement that the Association does not advise against the employment of persons suffering from any disability. It has been the general experience that the physically handicapped are good workers,

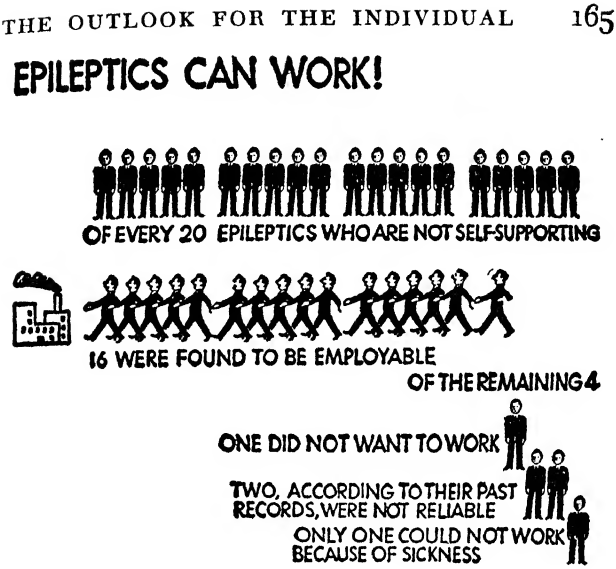


*Fig. 12.* Most people subject to seizures work, and more could do so. A graphic representation of the statistics. (From the pamphlet, Epilepsy—The Ghost Is Out of the Closet, by Herbert Yahraes, published by the Public Affairs Committee, Inc., New York 20.)

and records show that they have fewer accidents than the average employee who has no particular concern about his health. Specifically, many employers who have taken on workers under treatment for seizures have found them particularly appreciative, devoted and capable, and are usually willing to take more. The question of the legal situation of the employer, his industrial accident insurance company, and the epileptic worker, is considered at length in the book *Epilepsy and the Law,* which has already been mentioned (page 150).

The employer who does not carry liability insurance is in a slightly different situation, and shares to some extent the responsibility for providing working conditions which do not involve a special hazard for individual workers. The employee cannot absolve him from all responsibility, even by signing a waiver, which has no legal standing. It must be said, however, that apprehension on the part of the employer for his employees' health and for his own liability is often an excuse to cover the common prejudices concerning the disorder.

Perhaps the most eloquent commentary on the subject of employment is the fact that the majority of people under treatment for seizures do find work. A recent survey shows that about three-quarters of over a thousand patients taken at random from many communities were actually employed in a wide range of occupations.

This is small comfort to the hundreds of thousands who have not been able to find work because of seizures. Naturally, the first move for such an individual is to make certain that he is obtaining the most effective treatment available. If his attacks continue despite all that medical science can do, he may be able to set up some suitable business or farming enterprise for himself. Or he may be able to secure employment through one of the organizations devoted to the welfare of epileptics, if one exists in his state. In some communities, there are shel-

tered workshops for epileptics. These opportunities will be described further in the next chapter.

PROGRESS IN THE CONTROL OF SEIZURES
STATISTICS PREPARED BY
COMPETENT AUTHORITIES

In 1847, without special treatment, 13% of epileptics became seizure-free.

By use of bromides, introduced in 1857, 24% became seizure-free.

By use of phenobarbital, introduced 1912, 27% became seizure-free.

By use of ketogenic diet, introduced 1921, 27% became seizure-free.

By use of phenytoin, introduced 1937, 36% became seizure-free.

By systematic use of all available medicines, 1953, 56% became seizure-free.

By operations in selected cases, 1954, 32% of those operated on became seizure-free.

By standard plus narcosis treatment, 1953, 77% become seizure-free.

## We Should Do Better

The number of people in this world suffering from convulsions runs into the millions.

Only a small fraction of them receive proper treatment, owing to the insufficiency of local institutions and local interest.

More has been learned about seizures and their treatment in the last twenty-five years than in the century before; and more was learned in that century than in the preceding history of the world.

Qualified physicians in many medical centers are anxious to carry on the work, if provided with encouragement and funds.

The worst obstacles to progress are prejudice, pessimism and misinformation.

CHAPTER ELEVEN

# The Outlook for Control of the Disorder

## *The Problems Involved*

THREE GROUPS of problems confront those who would like to see progress made in the control of paroxysmal disorders, that is, "epilepsy" and related diseases. The first concerns our knowledge of the mechanism of seizures, the factors of heredity, the physiology of the brain, the physics and chemistry of the processes involved, and means of combating them. This is a highly technical field of research, in which there are many willing hands and brains, but a surprising paucity of funds.

The second group of problems has to do with the improvement of the care of patients. It includes a dissemination of new information about treatment, the training of specialists, and the formation of new clinics and hospitals. The initial expense of providing adequate facilities will be even larger than that of endowing research, but the immediate returns will be greater.

The third problem is that of public education. It requires the expenditure of energy and courage, rather than that of money.

### *The Technical Medical Problems of the Convulsive State*

Recent investigations have shown clearly that there is a correlation between seizures and the pattern of electrical discharges in the brain. The path of these discharges, and the manner in which they spread through the brain, can be followed by means of sensitive apparatus, involving high amplification. Thus our knowledge of the physical aspect of the physiology of convulsions has made great strides in the course of the past few years. The fundamental data of electro-encephalography have already been briefly described (*see* page 63).

Perhaps even more important are the chemical aspects of convulsions—which, however, were extremely difficult to study until methods of electrical amplification made it possible to study their effects. It now seems clear that there is normally a self-regulating mechanism in the circulation of the brain which holds the carbon-dioxide content of the blood leaving the brain, constant within narrow limits. An excess of carbon dioxide tends to cause the brain rhythm to become rapid, approaching that seen in *grand mal* seizures; a deficiency tends to slow it, sometimes producing slow waves suggestive of *petit mal* or psychomotor attacks. If a patient has a

convulsion while his brain is exposed at operation, a dilatation of vessels like that produced by excess of carbon dioxide may be seen to extend along the motor cortex from which originate the impulses producing the attack.

Recently much has been learned about the chain of chemical reactions which accompany the activity of nerve tissue. Facts have been acquired in various ways; for example, by comparing the chemical content of the blood in the arteries going to the brain with that of the veins draining it. Particularly interesting is a group of studies carried out on the electric eel, a primitive species of fish which possesses a peculiar organ consisting of masses of nerve tissue so arranged that it is capable of generating enough electricity to give a disagreeable shock on contact. In this tissue, the chemical steps which produce an electric charge at the expense of consumption of glucose can be studied individually. Moreover, the effect of adding certain chemical substances, and of various manipulations, can be studied. It is found that all of the medicines used in the treatment of seizures have a specific effect on certain reactions in the chain, and it seems possible that new methods of controlling its activity can be found.

Other important studies have been concerned with the diagnosis of "borderland" conditions. It has been shown, for example, that many patients are committed as "insane" to mental hospitals through the usual channels, who suffer

from dysrhythmias of the brain waves, resembling those seen in cases of epilepsy. Some of these individuals have seizures in addition, some do not. If seizures coexist with serious disorders of behavior, the diagnosis of "psychosis with epilepsy" is usually made. If no seizures have been observed, the diagnosis is based on the symptoms. Some patients in both categories can be made and maintained seizure-free by modern treatment, as was shown in Case 4 (page 18). We do not know, however, how large a proportion of such cases can be helped substantially by the newer methods, nor even their proportion in the population of large mental hospitals. This remains for the future to determine.

The subject of heredity of the tendency to seizures is being restudied by means of more careful methods, including electro-encephalography. The older accepted view that the tendency to seizures was always a recessive Mendelian hereditary trait, has been actively challenged recently by evidence suggesting that scarcely noticed degrees of birth injury, oxygen deprivation at birth and injuries and diseases of childhood may be of still greater importance. It appears already certain that the older statistics are unreliable, and in need of extensive revision. A more intensive study of large groups of cases over many years is urgently needed as a basis for medical advice and legislative reforms.

In the present fragmentary state of our

knowledge, there is room for a great variety of opinions. It seems to the author at least extremely doubtful whether preventing all those who have seizures from having offspring would actually eliminate the disorder in two generations, as some proponents of eugenics have hoped. A commission which reviewed the whole question for the American Neurological Association in 1936, came to the conclusion that legislation making compulsory the wholesale sterilization of certain sections of the population on the basis of mere theory was both unjustifiable and impractical, but that on the other hand legislative sanction to voluntary sterilization when recommended by qualified experts in individual instances was a considerable safeguard to the public.

### *Progress in Anticonvulsant Medicines*

The effectiveness of bromides, and of phenobarbital, against convulsions was discovered entirely by accident. A significant advance in methods of testing drugs for their anticonvulsant potency, consists in artificially producing convulsions in animals by the same general methods (which are painless) as are employed in the treatment of insanity in human beings. Of these, an electric shock applied to the brain appears to be most suitable for the purpose, but drugs producing convulsions (metrazol) have also been used. Judging from the experiences of human patients subjected to a similar

treatment, it produces immediate unconsciousness followed by a seizure if the current is sufficiently powerful. The precise amount of current required is extremely constant for a given animal. After the administration of certain anticonvulsant medicines, far more current—four or five times as much—may be administered without producing a seizure.

By this method of testing, several thousand different compounds have been studied. It has become clear for the first time that an anticonvulsant medicine need not be hypnotic (sleep-producing), as had formerly been supposed. The first of the specific anticonvulsants selected in this manner, sodium diphenyl hydantoinate or phenytoin, is now widely utilized in treatment, with outstanding success. The convulsions produced with current closely resemble typical *grand mal*. The medicines which have been found to protect animals against them are most effective against *grand mal* attacks in human beings. Attempts to find a method of testing which will permit us to estimate the effectiveness of medicines against *petit mal* and psychomotor attacks have been less satisfactory so far, but some worth-while medicines of this type have been found. The use of glutamic acid and similar substances (glutamine, oxybutyric acid) was suggested on purely chemical grounds, and other substances of this type are under consideration.

The tranquilizing drugs have been a great

boon to some patients subject to seizures. They have no effect on seizures, but may be helpful in controlling the anxiety and depression often associated with the disorder.

*Progress in Surgical Treatment of Seizure*

The surgical removal of tumors which produce convulsions is a delicate technical feat. The training necessary to fit specialists for it is now, however, more widely available than formerly, and slow, steady progress is being made toward making operations safer and more complete. For certain types of growth, treatment with radiation seems preferable to radical surgery. Great progress has been made in finding new and better methods of applying it.

Special questions arise in connection with the scars often found in the brain in cases of seizures. Much effort and ingenuity are now being exerted to find methods of determining the location and extent of scars, both before and during operation. The problem of finding better methods of removing scars without causing new ones is receiving intensive study. In this field also, progress is steady rather than dramatic. The use of operations on the frontal lobes for the control of epileptic furors and intolerable aggressive behavior has been widened, and the results have been enormously improved. It is now possible to carry out operations of this type without impairing the patient's intellectual ability or enjoyment of life.

The details and implications of the various special studies in the field of convulsive disorders are obviously beyond the scope of this manual. To sum up the subject for our purposes, there can be no doubt that many new and important facts may be uncovered by employment of means already in our possession, and that new methods can be devised in the future if proper financial support is made available to those working in the field.

### *Facilities for Special Medical Training and Education*

Much attention has been given lately by medical educators to the training of specialists in nervous and mental diseases, who should all be experts in the care of convulsive disorders. The American Psychiatric Association and the American Neurological Association both devote considerable time at their meetings to a consideration of the subject. The International League Against Epilepsy acts as a sort of clearing house of information and publishes a special journal, *Epilepsia* (Dr. Jerome K. Merlis, Editor, National Veterans Epilepsy Center, Cushing Veterans Administration Hospital, Framingham, Massachusetts). The results of special investigations and broader articles addressed to practitioners are published at intervals in journals available to all physicians. The Western Institute of Epilepsy was founded for the purpose of attacking the problems of epilepsy from

the social and psychological as well as medical aspects and its membership is open to any doctor of medicine, social worker, psychologist, or any properly qualified person officially connected with an accredited agency interested in the problem. It holds yearly scientific meetings. Its address is Box 111, Balboa Island, California. Machinery exists, therefore, for a free exchange and wide dissemination of ideas.

The establishment of fellowships to encourage the study of seizures would be most helpful.

### *Possibilities of Increase and Improvement of Hospitals and Clinics*

It is little short of scandalous to include "epileptics," many of whom are intelligent and responsible, among the "insane" in public hospitals, merely because they are indigent and have no other place to go. Furthermore, it is an economic waste, for many who suffer from uncontrolled convulsions are able to work, and do not need to be guarded as do most patients committed to state hospitals. In well-run "epileptic" colonies, a considerable proportion of patients are taught to manage their own treatment, and thus are enabled to leave. Extension of public facilities is urgently needed in most states. Most commendable programs have been initiated in Ohio and New Jersey. They include the following important provisions:

1. An experienced director is selected jointly

by the commissioner of mental hygiene, the state medical society, and representatives of a non-medical voluntary group interested in the subject. (In New Jersey, this was the state chapter of the Society for Crippled Children.)

2. The state custodial colony is transformed into a center for study and special treatment.

3. An attempt is being made to locate cases of epilepsy in state hospitals, and supply facilities for treatment.

4. The formation of local outpatient clinics is encouraged, and traveling clinics are organized.

It is extremely difficult to find proper private institutions away from home for patients needing temporary care who do not wish to go to state hospitals or colonies. Farms in the country, where a few patients could board at moderate rates, and have opportunities for out-of-door exercise, should be widely available. They are practically nonexistent. A great opportunity awaits development here.

There are special clinics for nervous and mental disorders, and for study of the convulsive state, in relatively few public or private hospitals. A list of them is available from the National Epilepsy League (page 180). There should be many more—and there could be, if the local public would insist upon it. Moreover, the proportion of successfully treated cases would unquestionably be increased if patients

were as a rule admitted to hospitals for special studies whenever it became clear that ambulatory treatment was ineffective. At present, most hospitals admit patients only for diagnosis, unless surgical treatment is required. The urgent need for special schools for children suffering from convulsions has been briefly outlined in the previous chapter. Suitable public day schools have been established in certain communities—Detroit, for example—and are outstandingly successful. They should be made part of the educational system of every large community. Intelligent epileptics should not be compelled to share classes with retarded children, as is customary in many cities. Providing tutors for individual handicapped pupils is an expensive substitute.

Good private schools for epileptic children who are not retarded are also rare. Lists of them may be obtained from the National Epilepsy League and the Society for the Brain Injured (*see* next page).

No individual can bring about the alterations in policy which have been outlined, but public opinion can readily do so.

### *The Public; Special Societies*

It would seem entirely feasible to accomplish what has been done for the public attitude toward tuberculosis, considered not so many years ago to be a disgrace to the patient and

his family. Data are already at hand to demonstrate that many of the prevalent conceptions —such that no effective treatment exists and that "epileptics" are "insane"—are entirely false, and are likely to cause a serious injustice to sufferers from the disorder.

There are three national societies interested in the subject of epilepsy. The National Epilepsy League (208 North Wells Street, Chicago 6) raises funds by individual solicitation, public drives and so on, keeps lists of specialists in epilepsy, special clinics and schools and the like, publishes a journal, *Horizon,* devoted to problems of epilepsy, and aids investigative work when funds are available. A provision in its charter precludes the possibility of its contributing to local facilities for treatment, and it has apparently not made a concerted effort to unite local or state societies.

The National Society for Crippled Children and Adults (11 South La Salle Street, Chicago 3), with local chapters in practically every city in the country, aims to serve all handicapped persons. Its primary objective is relief of the orthopedic diseases, but some of its facilities are available for epileptics also. The degree of interest in epilepsy apparently varies greatly from chapter to chapter. As has already been noted, the New Jersey state chapter took the initiative in setting up the excellent state program.

The National Society for the Brain Injured

### Some Practical Suggestions as to What Society Can Do to Help

Organize special school so that children may be protected from embarrassment, and receive both care and schooling until the seizures can be individually brought under control.

Create more and better institutions for the care of the more severe cases while a program for the individual study and control of their seizures is gotten under way.

Help overcome the fear and misunderstanding which sometimes make life unhappy for patients between the attacks.

Insist upon revision of the many unjustified and antiquated laws restricting the activities of "epileptics."

Encourage and support medical research in this field.

A dollar will buy more welfare in the field of epilepsy than in any other in this country.

(2255 West Adams Boulevard, Los Angeles) takes a particular interest in epilepsy also. Its activity is aimed at providing local facilities for treatment, especially of cases complicated by

speech disorders, behavior problems, and emotional disturbances. It is a relatively new organization, and so far has branches in only a few cities. It does, however, have a valuable list of clinics and schools dealing with special problems.

The Institute for Child Study, 2255 West Adams Boulevard, Los Angeles, has in preparation a correspondence course for parents of brain-injured and epileptic children, in part, by a prepared outline of reading exercises, questions and answers; in part by individualized advice from experts in the various special fields related to the problem.

In a few states, for example California, Oregon and Wisconsin, and in a few cities, for example New York and Houston, Texas, there are local societies aimed at raising funds, supporting clinics, publishing articles dealing with epilepsy, helping to find work for epileptics, sponsoring social clubs, and the like. It is worth looking in the classified telephone book under "Associations and Societies" to see if there is one in the large city nearest you.

The following local societies appear to be solidly established:

The California Epilepsy Society, 1904 West 48th Street, Los Angeles, California

Illinois Epilepsy League, Inc., 327 South La Salle Street, Chicago 4, Illinois

The Epilepsy Information Center, 319 Longwood Avenue, Boston 15, Massachusetts
United Epilepsy Association, 113 West 57th Street, New York 19, New York
Epilepsy League of Oregon, 220 East Alder Street, Portland 4, Oregon
Wisconsin Epilepsy League, 1130 East Dean Road, Milwaukee 17, Wisconsin
Federal Epilepsy, Arlington, Virginia

Those subject to seizures do not have to be lonely. In several communities, purely social clubs have been formed, which create a feeling of community interest and mutual support, most helpful to all who participate.

In several cities, sheltered workshops have been established for epileptics. One of the earliest was the Auracraft workshop in Cleveland. There is one called Epihab in Los Angeles, which operates a small assembly plant serving local airplane factories in the vicinity on a competitive commercial basis, and thus affords employment for about twenty epileptics, whose attacks are largely or wholly controlled. Naturally, it is hoped that many of them will go on to other employment when they have proved their ability to produce.

Such social clubs and workshops serve a useful purpose. It would be unfortunate, however, if they were to absorb too large a proportion of the energy and funds available for the bene-

*fit of epileptics, to the neglect of improvement of facilities for improved medical treatment.* The founder of the social service movement, Joseph Lee, used to say, "Water the root, don't tie on the fruit."

In several cities, also, individual industrial plants have made an organized attempt to find suitable employment for epileptics still having seizures. In Los Angeles, for example, many hundred have been quietly absorbed into the working world; but many hundred more have not been so fortunate. Information regarding the possibility of employment may usually be

MUCH REMAINS TO BE DONE

The first duty of every person subject to seizures is to learn to control them.

The second is to live as normal a life as possible.

Every patient who does well for himself helps to dispel false ideas about the condition.

Physicians should devote more study to the essential details of treatment.

Lawyers and legislators should try to systematize the legal questions involved.

All interested should support scientific work, special clinics and societies fostering more realistic attitudes toward the problem.

secured through the local epilepsy society or social service organizations.

There are two rather small nonprofit foundations, devoted primarily to research work in the field of neuropsychiatry, which have financed a substantial proportion of the recent advances in the treatment of epilepsy, with practically no overhead expenses. They are the Fund for Research, Inc., 1000 Park Avenue, New York, and the Tracy J. Putnam Foundation, Inc., 450 North Bedford Drive, Beverly Hills, California. Contributions are tax-deductible.

### *The Problem of Legislation*

From what has already been said in the preceding chapter (pages 154, 163), it is obvious that a person suffering from seizures may be subject to certain special legal restrictions. Some of them are intended for his own benefit as well as that of society; for example, the usual prohibition against driving an automobile. Others are aimed at eliminating the constitutional tendency to convulsions from future generations. This is a worthy motive, and there can be no doubt that in general the state has the right and power to enact and enforce eugenic legislation. How far it is wise to do so specifically in respect to convulsions is another problem.

A survey of the statutes dealing with the subject of "epilepsy" shows clearly that most of them reflect the old, now obsolete, concep-

tion that "epilepsy" is a predominantly hereditary disease, almost certain to appear in the children of every sufferer, incurable, incapacitating, and likely to lead to mental deterioration. Taking the written law at its face value, a person subject to seizures might find cause for real alarm in many states.

The situation is probably not nearly so bad as it appears on the surface, however. Common-law interpretations in this field based on a consideration of individual cases seem far more reasonable than legislative enactments based on theories in part outdated, and the good sense of prosecutors, courts and juries appears to offer a real protection against the injustices implied by some existing statutes. A review of the literature, and contacts with many patients, have left the author with the impression that the laws restricting the activities of "epileptics" are widely disregarded.

This fact is no excuse for the existence of obsolete laws. A body of well-informed public opinion can and should compel a reconsideration of them, in the light of what is now known of seizures and their causes. For a more complete study of these laws with concrete recommendations for their reform, the reader is again referred to the book by Barrow and Fabing, *Epilepsy and the Law* (*see* page 150).

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